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THE EDUCATION OF A GEOGRAPHER*

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ON ORIGINAL BENT AND EARLY PREDILECTION

As professionals we claim only that we are privileged to devote ourselves to the field of geography. Neither we nor our academic predecessors discovered the field, nor have we ever been the only ones who have tilled it, nor is it likely to be properly attended should it be thought restricted to those who claim privilege and competence from appointment and title. The first professor of geography in the world was named in 1820; I am of the early second generation in the United States. We of the vested succession must always remember that we have never been more than a few of those who contribute to the growth of geographic knowledge. The interest is immemorial and universal; should we disappear, the field will remain and it will not become vacant. We may draw no invidious distinction between professional and amateur; both are needed as cherishing and contributing to geographical knowledge. The gloss here is: An association of minds is not determined by a committee on credentials.

The geographer partly is born, partly shaped by his early environment, and comes rather late into our professional care. This is the usual and proper condition. We are also recruiting officers, and we do need to recognize good material in the raw state. I suspect that we have more than ordinary difficulties as talent scouts. How common is a boyhood ambition to be a geographer? It is an unlikely interest to assert itself early or to be admitted to one's mates or one's self in school age. In college we know too well that a professed and actual liking for taking courses in geography (and success in getting good grades) is an indifferent indication of future promise. The student may be beguiled by his temporary contacts and surroundings, such as the attractive qualities of an instructor. When he is detached from such stimulus he may sink into inaction and after a time no more be heard of him. How can we discover aptitude, emergent interest, and the promise to continue in independent growth? This is our first concern. If we select well, half of our problem is solved.

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Let me not appear to discount the value of the great school, but let us also not overrate it. Whoever shared in those golden early days at Chicago knows the stirring of the spirit in the group Salisbury assembled. Salisbury had great clarity of exposition and the ability to develop a theme by rigorous questions, but what I cherish most of him was that he respected curiosity and doubt on the part of the student. He liked the informed dissenter. Hettner, Philippson, Fleure will be remembered as masters of instruction; from their schools have come a considerable number of the best of our European colleagues. Their students were drawn from and continued to develop along quite different directions, and were not shaped over one last by their student training.

What one learned in class may be forgotten, but what is remembered is the stimulation by association of related yet varied personalities and interests. The invitation of the student period should be greater than the discipline. I should not like to think of any one as the product of a particular school, but as having been found and nurtured at the right time by good gardeners. And thus we get back to the young plants that may flourish in our care, or may do so without it.

We are not a precocious lot, nor should we wish to be. We are unlikely to start early and we need a long time to mature. Ours is a task of slow accumulation of knowledge, experience, and judgment; techniques and formal processes of analysis and of generalization are subordinate. We do not gain competence quickly, nor by the learning of one special skill. We are subject to shifts of focus as we learn more about whatever we are working at. The start on one theme may turn into a different one. It is either distressing or exciting, according to one's nature, to find that the trail one expects to lead toward a certain point may carry one into unexpected directions. It seems to be a quality of our particular kind that we require always more readiness to learn what is relevant than to perfect ourselves by specific training and method.

It is proper, therefore, that we have been reluctant to accept a general formal discipline, that in our more confident moods we imagine ourselves with the power to explore in many directions, and that we admit to our group different temperaments and diverse interests. It has always been characteristic that we have been made up of individuals of many backgrounds, with some denominator in common. That our departments and institutes have multiplied in later years has not altered our plural origins and will not do so, I hope.

It is, I think, in our nature to be a heterozygous population. Despite the line breeding now available by extensive series of courses in geography, running from the freshman year to the Ph.D., we still get much of our best blood from those who come from quite other academic stocks and backgrounds. These join us not because they have been inadequate in their previous commitments but because it took time for them to find their place over on our side. A revealing history of geographers and of geographic thought might be written about this theme of convergence of individuals out of different origins and conditions.

May a preselective bent toward geography be recognized before it asserts

itself as deliberate election? The first, let me say most primitive and persistent trait, is liking maps and thinking by means of them. We are empty handed without them in lecture room, in study, in the field. Show me a geographer who does not need them constantly and want them about him, and I shall have my doubts as to whether he has made the right choice of life. We squeeze our budgets to get more maps, of all kinds. We collect them from filling stations to antique shops. We draw them, however badly, to illustrate our lectures and our studies. However little a member of your institution may know what you are doing as a geographer, if he requires map information he will call on you. If geographers chance to meet where maps are displayed (it scarcely matters what maps) they comment, commend, criticize. Maps break down our inhibitions, stimulate our glands, stir our imagination, loosen our tongues. The map speaks across the barriers of language; it is sometimes claimed as the language of geography. The conveying of ideas by means of maps is attributed to us as our common vocation and passion. Even in the most fundamentalist period of this Association those devoted to maps were admitted to the elect.

A map invites attention alike synoptically and analytically: What kind of a road is marked; through what kind of country does it run? Its symbols are translated into images and these are assembled in the mind's eye into meaningful associations of land and life. We use them as actual guides and we enjoy them in armchair travel. Who has not journeyed by map to Tibesti or Tibet, raised the peaks of Tenerife or Trinidad on the western horizon, or sought the Northwest Passage? Who has not been with Marco Polo to Cathay, with Captain Cook to the Sandwich Islands, and with Parkman over the Oregon Trail? Who reads fiction for plot, suspense, or psychologic conflict, or to be transported into tropical shores with Stevenson or Kenneth Roberts, to India with Kipling or Masters, to know Florida with Marjorie Rawlings or New England with Esther Forbes?

The geographer and the geographer-to-be are travellers, vicarious when they must, actual when they may. They are not of the class of tourists who are directed by guide books over the routes of the grand tours to the starred attractions, nor do they lodge at grand hotels. When vacation bound they may pass by the places one is supposed to see and seek out byways and unnoted places where they gain the feeling of personal discovery. They enjoy striking out on foot, away from roads and are pleased to camp out at the end of the day. Even the urban geographer may have in him the need to climb unpopulated mountains.

The geographic bent rests on seeing and thinking about what is in the landscape, what has been technically called the content of the earth's surface. By this we do not limit ourselves to what is visually conspicuous, but we do try to register both on detail and composition of scene, finding in it questions, confirmations, items, or elements that are new and such as are missing. This alerting of the mind by observing what composes the scene may derive from a primitive survival trait when such attention meant the avoidance of peril, want, getting lost. In my days of field work in back areas of Mexico I learned to accept confidently

the geographic and natural history competence of the native guides. They knew how to interpret the lay of the land, to keep a mental map, to note almost any change in the scene. They were usually able to identify the plants and were right as to systematic grouping and ecologic association.

Geography and natural history are indeed related by their manner of observation. Much of what both identify and compare lies outside of quantitative analysis. Species are not recognized by measurements but by the judgment of those well experienced in their significant differences. An innate aptitude to register on differences and similarities is joined to a ready curiosity and reflection on the meaning of likeness and unlikeness. There is, I am confident, such a thing as the "morphologic eye," a spontaneous and critical attention to form and pattern. Every good naturalist has it, and many of them are also very good at geographic identification and comparison.

The term "morphology" came into the study of land forms a hundred years ago; it is at the very heart of our being. We work at the recognition and understanding of elements of form and of their relation in function. Our forms and their arrangements are grossly macroscopic and infinitely numerous so that we have always to learn about selecting what things are relevant and eliminating the insignificant. Relevance raises the question of why the form is present and how it is related to other forms. Description is rarely adequate and even less often rewarding unless it is tied to explanation. It seems necessary therefore to admit to the geographic bent the fourth dimension of time, interest in how what is being studied came to be.

Some of us have this sense of significant form, some develop it (and in them I take it to have been latent), and some never get it. There are those who are quickly alerted when something new enters the field of observation or fades out from it. One of the rewards of being in the field with students is in discovering those who are quick and sharp at seeing. And then there are those who never see anything until it is pointed out to them. At this time screening of recruits may begin, if geography is a science of observation. The premise here is that we build from things seen and analyzed, however provisionally, to a comparison with data from elsewhere, from someone else, or inferred by necessity from a past that cannot be seen.

ON BEING UNSPECIALIZED

Geography as explanatory description of the earth fixes its attention on a diversity of earth features and compares them as to their distribution. In some manner it is always a reading of the face of the earth. We professionals exist not because we have discovered a line of inquiry or even own a special technique but because men have always needed, gathered, and classified geographic knowledge. The names we apply professionally to the items or forms that we identify and perhaps even to the processes we pursue are commonly and properly derived from many vernaculars; we organize them into a vocabulary of wider and clearer intelligibility. Often the languages of primitive peoples and the dialects of our

own cultures provide us with more meaningful terms than does literary speech. A familiar illustration is in the meaning of land, vegetation, and cultural forms for which we borrow from local speech and extend their application to other areas.

In addition to such naming of geographical categories, both physical and cultural, out of popular speech, we add retrospective knowledge of past conditions from the study of geographical proper names. (Marginal note: The topical and local geographical vocabulary of languages is a substratum of learning that still awaits exploitation, both for the identification of kinds of our phenomena and for comparative cultural insights. A bow, therefore, to colleague Burrill and another to the newly-founded American Name Society.)

In this sermon, as one may do in a sermon, I return to the opening text that geographic content, relations, processes—in sum, geographic awareness—are of reason and necessity wider than what we, the professors of geography, work at. Beyond and around what we study today lies an area of interest of identifications and concepts which we do not intend to appropriate only to ourselves. The subject is and will be greater than the sum of our disciplinary efforts. We do claim a superior obligation to contribute in all the ways we are able, asserting no prior rights or competence that derive only from our profession. The Association of American Geographers was begun and was carried through its earlier years by that notable group of founders who met together because of their affection for the subject, though their professional jobs were elsewhere, in geology, biology, history. Those were very good days, followed by a time of restrictive association when those who held jobs in geography were chosen over those who brought ideas and observations. Happily this time seems to be past and we again are broadening the compass of our fellowship.

If we shrink the limits of geography, the greater field will still exist; it will be only our awareness that is diminished. Though the individual limits his own efforts, he may not ask the same limitation of others, nor deny his approval of efforts that go into another direction. A geographer is any competent amateur —in the literal sense—of whatever is geographic; may we never wish to be less than that.

A particular method for inspecting data is known to all scholars as the geographic method, based on charting the limits or range of phenomena, features, or traits that have a localized distribution on the earth. The mapping of distributions was begun by natural historians, or natural philosophers as they were called in the eighteenth century, who were interested in the limits of species and thus in the spread or dispersal of organisms to the extremity of their ranges. This cartographic description is always topical and analytic: What qualities of environment, dispersal routes, elapsed time, and interdependence or competition established the boundaries beyond which a particular animal or plant does not occur? A century and a quarter ago Berghaus extended such topical mapping to include not only biotic and physiographic data, but cultural ones, as of peoples, economies, and languages. Ratzel examined the distribution of culture traits, as of primitive

technology, and was largely responsible for the attention given since then by ethnologists to the spread or diffusion of specific learnings or skills.

An arduous and rewarding art of detection is offered by these distributional studies: They are geographically descriptive because they are concerned with terrestrial extension; they are geographically analytic because they demand proper identification of the items under scrutiny and of comparison with other distributions; they are geographically dynamic because they seek clues from distributions for explanation of presence or absence, of origins and limits. Distribution is the key to process. The intellectual satisfactions of such inquiries are inexhaustible. Their pursuit will continue to be carried on by workers in many disciplines, from which we may gain knowledge but in which we also must participate more than we do.

It is neither necessary nor desirable that we consider the totality of region as the common basis of geographic study. Individual interest and competence begins and may remain with specific elements of nature and of culture and with the meaning of their spatial relations. If we say that our job is only to synthesize, we are likely to become dependent in all things on others for the validity of what we assemble and interpret.

Though the analytic distributional method thus called geographic is employed with skill and penetration by others than ourselves, it is also the one most rewarding to our purposes. We must individually try and hope for competence in learning more or most about the distribution of some thing or group of things. I do not accept the idea that anyone can do the geography of a region, or comparative geography, when he knows less about anything he assembles than others do, as I do not accept the notion that every geographer must be concerned with regional synthesis. The ineptly named holistic doctrine leaves me unmoved; it has produced compilations where we have needed inquiries. This is no counsel of despair but rather I wish to say that geography, like history, resists any overall organization of interests, directions, or skills, yet does not lose thereby an acknowledged position of its own kind of knowledge and of valid process of discovery and organization. In a time of exceedingly great increase of knowledge and techniques we remain in measure undelimited and, I may add, unreduced to a specific discipline. This, I think, is our nature and our destiny, this our present weakness and potential strength.

We continue properly to be, as I have said that we have been always, a diverse assemblage of individuals, hardly to be described in terms of dominance of any one kind of aptitude or temperament, mental faculty, or emotional drive, and yet we know that we are drawn together by elective affinity. It is about as difficult to describe a geographer as it is to define geography, and in both cases I am content and hopeful. With all shortcomings as to what we have accomplished, there is satisfaction in knowing that we have not really prescribed limitations of inquiry, method, or thought upon our associates. From time to time there are attempts to the contrary, but we shake them off after a while and go about doing what we

most want to do. There are institutional and curricular pressures, but these are not intellectual directives. One of the wisest of university administrators has said that any department is largely a budgetary convenience.

It seems appropriate therefore to underscore the unspecialized quality of geography. The individual worker must try to gain whatever he can of special insights and skills in whatever most absorbs his attention. Our overall interests, however, do not prescribe the individual direction. We have a privileged status which we must not abandon. Alone or in groups we try to explore the differentiation and interrelation of the aspects of the earth. We welcome whatever work is competent from whatever source, and claim no proprietary rights. In the history of life the less specialized forms have tended to survive and flourish, whereas the functionally self-limiting types have become fossils. Perhaps there is meaning in this analogy for ourselves, that many different kinds of minds and bents do find congenial and rewarding association, and develop individual skills and knowledge. We thrive on cross-fertilization and diversity.

THE TRAINING PERIOD

In the training period we have our different ways of selecting and conditioning the prospects. The comments here offered are those of one weather-beaten coach who has watched many a spring practice through midseason performance.

In the first place I doubt that undergraduate majors in geography are to be recommended for those who will continue as graduate students. The bigger the major program gets and the more prerequisites get hung onto it, the less is likely to remain of a properly balanced liberal education, and the less leeway exists for the student to delve into areas of knowledge that he needs for his individual education. We too have been swept along by the current specializing academic trend that is narrowing the higher educational process almost everywhere on our side of the Atlantic and is pushing academic departments into applied and technical orientations.

Putting labels on beginners herds them into premature profession. Registrars and other administrators like such facilities of identification and advancement; we are caught because departments depend on budgets, enrolments, and other kinds of numbers that have little relevance to the ends of learning. A good undergraduate diet for us would be a sharply limited number of geography courses (limited especially as to the number of regional ones), one enriched in the staples of liberal arts, and especially in natural and cultural history. A big departmental curriculum is probably a sign of bloating, not of fecundity.

What benefit of training and insight comes out of regional courses? After many years I am no closer to an answer. I think we give far too many such courses, that they may be given for indifferent reasons, and that too often they contribute little to learning or to skills. More and more the concern with regional classifications and regional boundaries leaves me cold. I find that I like my courses on Latin America better since I have given up any system of geographic regions.

Who can, or wants to remember, a lot of regional subdivisions anyway? In our own operation we decided long ago that we should give a regional course only if the instructor had prior and major preoccupation with such an area, and especially if it was based on continuing field studies, topical rather than inclusive in content.

A good regional course is largely an individual creation out of long application, involving physical discomforts and pleasures, muscular, cutaneous, and gastric, and it has been nursed on much meditation. It demands some ability and interest in physical geography and an understanding of other ways of life and how they came about. A really intimate association with other cultures is needed and slow to be acquired. To me it is a study in historical geography. Such a course may indeed open new vistas to the young student and leave a lasting impress on his education. Such a course, however, grows slowly and is not built on any generally applicable, nor on a symmetrical or encyclopaedic organization of subject matter. If it is truly instructive, it can hardly be reproduced or revised by someone else, nor serve as model for the construction of parallel courses for other regions. Thus the area study programs, much promoted and subsidized in the last years, have of necessity relied on pre-planned organization, on methodologic unity, and on derived data rather than on experienced observation. Similarly we have a lot of regional courses that are organized assemblages of industriously collected facts, taken at second hand. *A* writes such a book, *B* uses it as a text, and thus regional courses proliferate.

If we prune out a lot of the regional work now spread through our curricula we shall also urge ourselves to move the topical courses out of their present obscure corners. Topical courses have the advantage that they are analytic, and their elements may be scrutinized at any scale of inspection and by more or less adequate techniques. In the education of the student and his postgraduate development the topical inquiry is attainable and rewarding.

I am becoming more and more doubtful that regional studies are for the beginner in research. The more I see of regional theses, with their descriptions and classifications, and dot maps, that are possibly useful but are mainly secondary collections of presumed facts, the more do I wish that this time and energy had been focussed on some topic which is a problem. What problems are stated and at least partly resolved in an average regional thesis? The incipient regional geographer is either sadly at a loss to determine what he wishes to describe, or else follows a routine grouping of data which depresses his job to pedestrian performance. One end of geographical knowledge *is* comparative regional understanding; I don't agree in the least that it must be the only end, to which topical studies are only considered as building stones. I'll commit myself further and say that if most younger students stayed on the trail of themes rather than of regions, our contributions to knowledge would be more numerous and of a higher order.

Once most geographers in America did physiographic or geomorphologic studies as a matter of course. They still do so in other parts of the world and, as we have seen here, in Canada. We have lost in insight by their abandonment.

Any kind of a geographer profits by knowing how processes of weathering, transport, and deposition fashion any part of the face of the earth he studies. We have abandoned also a strong, and perhaps the most available, incentive to field observation and for training the eye to recognize features diagnostic for explanatory description. The morphology of land forms links form to process; it requires selective observation and critical judgment as to what has happened to the surface studied. I would not have missed what I learned from Salisbury and Leverett and others in recognizing glacial land forms, setting up multiple hypotheses, and coming to a conclusion as to the meaning of the evidence. When we dropped land forms as our business, we lost a major stimulus to get into the field, to see and think, to state and solve problems. We replaced a lively and promising science with pedestrian schemes of description, perhaps designed even so as to circumvent curiosity. And, we are denying the young student one of the best and most generally present means of training the eye to see and the mind to develop generalization. It is hardly accidental that so many of those who have contributed most to human geography also, at least in their earlier years, made original contributions to physical geography.

The field of biogeography requires more knowledge of biology than can be demanded of most of us. It is, however, so important to us and so inadequately cultivated from almost any side that we should encourage the crossing of geography with natural history wherever the student is competent. In particular, we need to know much more of the impact of human cultures on plant cover, of man's disturbances of soil and surface, of his relation to the spread or shrinkage of individual species, of human agency in the dispersal and modification of plants. To these questions a few of us are, and more should be, addressing ourselves. This advice means, of course, again that I do not see our future in a retraction within limits that set us apart from other disciplines. Especially do we need more workers who like and are able to live on frontiers, such as those of biology. Nor does this mean that we are trying to wrest territory from others. Plant distributions and the intervention of man in the rest of the organic world we know to be major themes of geography. Brunhes made that lesson clear to all. We cannot fail to be concerned with man as a steadily increasing dominant of the living world, and therefore we need more familiarity with natural history, including its modes of field study and how it sets up its problems. Homer Shantz is our finest example of significant contribution in this manner; what he has brought to meetings of this Association in specific insight and general wisdom will long be remembered. In Europe the tradition is old and general. In Germany, for example, geography has been biogeographically enriched from the days of Humboldt, through Gradmann, Waibel, Troll, to Wilhelmy. These and others have been better geographers, whether they turned to land forms or human cultures, because they were able to make sense out of *Standort* or localization of biotic data. Waibel, fondly remembered by a number here, transferred the sense of problem he developed in biogeography into economic and population geography.

Underlying what I am trying to say is the conviction that geography is first

of all knowledge gained by observation, that one orders by reflection and reinspection the things one has been looking at, and that from what one has experienced by intimate sight comes comparison and synthesis. In other words, the principal training of the geographer should come, wherever possible, by doing field work. The important question here is not whether he gets practice in mapping techniques but whether he learns to recognize forms that express function and process, to see problems implicit in location and areal extension, to think about joint or disjunct occurrence. The class of forms, be they of land, vegetation, or culture, is optional; the important thing is to get this awareness of form started up, to recognize kind and variation, position and extent, presence and absence, function and derivation—in short, to cultivate the sense of morphology.

The field excursion and field class need not be concerned with a predetermined organization of observation, such as is contained in a synoptic map legend. Leads aplenty—physical, organic, or cultural—will turn up in the course of walking, seeing, and exchange of observation. A successful field experience may well result in a different topic for each participant. To some, such see-what-you-can-find field work is irritating and disorderly since one may not know beforehand all that one will find. The more energy goes into recording predetermined categories the less likelihood is there of exploration. I like to think of any young field group as on a journey of discovery, not as a surveying party.

Such excursions and field courses are the best apprenticeship. The student and leader are in running exchange of questions and promptings supplied from the changing scene, engaging in a peripatetic form of Socratic dialogue about qualities of and in the landscape. The mode of locomotion should be slow, the slower the better, and be often interrupted by leisurely halts to sit on vantage points and stop at question marks. Being afoot, sleeping out, sitting about camp in the evening, seeing the land in all its seasons are proper ways to intensify the experience, of developing impression into larger appreciation and judgment. I know no prescription of method; avoid whatever increases routine and fatigue and decreases alertness.

It is one of our oldest traditions to start by observing the near scenes; it is equally in the great tradition that the journeyman goes forth alone to far and strange places to become a participant observer of an unknown land and life. An interesting test of American geography is being tried and with unexpected response in the new grants which have been set up for the purpose of getting young persons out into distant and poorly-known ends of the earth, as leisurely observers. One of the finest experiences of youth is to go where none of your kind has been, to see and learn to make some sense out of what has not been known to any of us. The nestling of classroom, drafting table, and library needs all encouragement we may give to develop the power of ranging and solitary flight.

The training of the geographer should give attention finally to the history of geographic thought, to the ideas that have prompted and focussed geographic inquiry, and to the circumambient intellectual climates within which geography

has lived at different times and places. We, as little as any group, can be content with current literature, or with what is available to us in English. Complacency as to our own language means the exclusion of a great, probably the greater, part of what has been well learned and well thought about. Can anyone say that he chooses to remain ignorant in his own work, because it requires exertion to find out what has been done in other times or written in another language? A scholar does not limit himself to what is most convenient, least of all to such arbitrary reduction of knowledge. A monolingual Ph.D. is a contradiction of terms, one who has not been stirred by the history of ideas, their persistence, alteration, or fading, and who condemns himself to live in needless poverty.

Mainly I have been leaving the trail unmarked by any arrows of methodology. We live in a day when method is being sought, thought, and professed, especially by those who call themselves social scientists. We still stand uncommitted though we are being advised that we too should observe a properly defined methodology. A little of this is a tonic, but it becomes easily habit forming and diverts the addict from productive work. I should rather recommend that we can learn more from the study of dominant ideas and problems as they have arisen in geographic work, from the objectives and changes of interest as shown in the lives of those who have contributed most. What I think geography should be illustrates only my own preferences. *What* geography is, is determined by what geographers have worked at everywhere and at all times. Method is means; the choice is with the workman for his particular task; the critic may object to incompetence but not to what the author has sought. Let us ask "what is geography" by looking for and appreciating whatever has been done well and with new insight.

DESCRIPTION FOR WHAT?

I hope to get through this presentation without any dictum as to what is geography. We begin by selecting the kinds of things proper to be described for the inquiry in hand. The theme in each case provides the screen for the data and guards against excessive and irrelevant scattering of attention. The conventional areal study may be an encyclopaedia but it is not a synthesis. Are we not under a form of inductive fallacy if we collect lots of data on lots of subjects thinking these will somehow acquire meaning? Such humility is, it would seem, hope unduly deferred from the plodding collector to some one else who may at some future time make use of the pieces of wood that have been hewn and stacked. I know of no general or inclusive descriptive system for regional study that has the promise of a real taxonomy.

There is at present enthusiasm for field mapping and their techniques. The geographer, we are told, should get into the field and map and map. But map what and to what purpose? Is not this possibly another horn of the dilemma? Topically, as for land forms and plant assemblages, mapping is feasible and may be rewarding, if it is morphologic, not merely morphographic. Lately we are getting a spate of land-use surveys, urban and rural. Having been one of those

responsible for starting these up (dualistic, if you wish, but 'holistic' never), I have become increasingly doubtful about them as means of discovery. Setting up the legend should be fine mental exercise; executing it by mapping soon runs into diminishing returns, except for revision of legend. Revision of scheme in some measure invalidates what has been mapped before; it is therefore resisted as delaying the job. The legend is apt to become master of the observer, depressing and limiting his observations to predetermined routine. Routine may bring the euphoria of daily accomplishment as filling in blank areas; the more energy goes into recording, the less is left for the interplay of observation and reflection. Don't commit your field season to a mapping stint unless you know it is demanded by a real and present problem. Time-consuming precision of location, limit, and area is rarely needed; sketch maps of type situations, cartograms at reduced scales serve most of our purposes. Field time is your most precious time—how precious you will know only when its days are past.

The "unit area" scheme of mapping may be a useful cataloguing device like the decimal systems of librarians, though I doubt it, but as a means of research I should place it below almost any other expenditure of energy.

These misgivings about mapping programs and their techniques rest on a growing conviction that we must not strain to make geography quantitative. Quantification is the dominant trend in our social sciences, which are imitating the more exact and experimental sciences; it happens to be fostered at the moment by the liking of those who dispense funds for long-term programs and institutional organizations. I think we may leave most enumerations to census takers and others whose business it is to assemble numerical series. To my mind we are concerned with processes that are largely non-recurrent and involve time spans mainly beyond the short runs available to enumeration.

BEYOND FORMAL SCIENCE

Beyond all that can be communicated by instruction and mastered by techniques lies a realm of individual perception and interpretation, the art of geography. Really good regional geography is finely representational art, and creative art is not circumscribed by pattern or method. We are unduly embarrassed to let ourselves appear in public without the identifying insignia of our cadre. Vidal de la Blache freed French geographers from such qualms, and French geography has been notable for vivid and meaningful regional portrayal. We may have more latent artistic talent than we know, but we don't encourage it and so it becomes suppressed. Many a letter is written from the field that enlivens and enlightens the study, but no trace thereof gets into the finished report. Why can't a geographer working in the Great Plains convey to the reader the feel of horizon, sky, air, and land that Willard Johnson did? Or what Shaler and Ellen Semple did for Kentucky and its people? Why make our regional studies such wooden things which no one may read for the insight and pleasure they give?

Esthetic appreciation leads to philosophic speculation, and why not? Are

not the compositions of nature, the lines of colors of terrain and of mantling vegetation, proper to consider? How almost inevitably right are the rural scenes wherever simple folk have designed and placed their habitations! The structures of man express function in adaptation to site, with the identifying stamp and preference of each particular culture. There is an esthetics of the assemblage of forms, an esthetic morphology of landscape, latterly often violated by industrial civilization. Is not this question of the harmonious landscape also something proper to think upon?

We need not say that it is not for us to cross the threshold of value judgments. We are largely committed to the study of human behavior; it is proper and reasonable that we are troubled as to how man has acted for good or evil. Social science as practiced today has not replaced moral philosophy. As we study how men have used the resources available to them, we do distinguish between good and bad husbandry, between economical or conservative and wasteful or destructive use. We are distressed by the progressive impoverishment of parts of the world. We do not like soil erosion, forest devastation, stream pollution. We do not like them because they bring ugliness as well as poverty. We may cast up accounts of loss of productivity but we think also that misconduct is more than a matter of profit and loss. We are aware that what we do will determine for good or evil the life of those who will come after us. And therefore we geographers, least of all, can fail to think on the place of man in nature, of the whole of ecology. Man's intervention in and disturbance of the organic and inorganic world has become so accelerated that we may be tempted to escape from the present into a future in which technology has mastery over all matter, and thus promises forgiveness and redemption. But will it? Is that our fated way; is that the sort of world we want? The moralist lives apart from the quotations of the market place and his thoughts are of other values.

There is nothing wrong with academic geography that a strong coming generation cannot take care of. We can have the needed succession if we free it as much as we may to do what each can do best and wants most to do. It is not for us to prescribe by definition what they shall work at or by what method they shall do so. Academic freedom must always be won anew.

THE WATER BALANCE OF INDIA ACCORDING TO THORNTHWAITE'S CONCEPT OF POTENTIAL EVAPOTRANSPIRATION

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IN a recent paper[1] Puri stressed the importance of precipitation-evaporation ratio for the study of some of the problems of forestry and agriculture in India and pointed out the urgent need for the installation of evaporimeter centers all over the country with particular attention to their extension to forested regions. It would appear that what is more properly needed for such an investigation is a dense net of evapotranspirometer centers. Although it is strongly felt by many investigators that evaporation from a free water surface is the same as evapotranspiration from a densely vegetated region adequately supplied with moisture, this has not so far been verified experimentally. Attention of workers in this field is now being directed to the measurement of evapotranspiration from large experimental soil-filled tanks sunk in the ground and suitably exposed to the environment under natural conditions. Work is, at present, carried out at many places in the United States of America and elsewhere along these lines, but it will be some time before sufficient data become available.

Empirical formulae have appeared from time to time for the computation of evaporation from other meterological factors. About twenty years ago, Raman and Satakopan[2] computed evaporation for a number of stations in India with the aid of a slightly modified Rohwer formula which was derived from a comparative study of the results of observations from a larger number of U. S. Weather Bureau standard class-A evaporation pans intended to give natural evaporation from free-water surfaces. The applicability of this formula, therefore, for the evaluation of natural evapotranspiration from large land areas covered with vegetation is open to question. Nevertheless, the work of Raman and Satakopan is very interesting, being the first of its kind in India, and has revealed certain important features of the regional climate of the Indian sub-continent.

Climatological literature abounds in attempts to characterize the dryness or wetness of regions by considering the variability of precipitation. This has probably been due to the fact that precipitation is one element that is measured at a large number of meterological stations and for which a good statistical record exists. But the so-called "effective precipitation," which can be obtained from a

[1] G. S. Puri, "Forest Ecology and Evaporation Measurement in India," *Science and Culture*, Vol. 15 (1950), pp. 465–467.

[2] P. K. Raman and V. Satakopan, "Evaporation in India Calculated from Other Meteorological Factors," *Scientific Note on the India Meteorological Department*, Vol. 6, No. 61 (1934).

comparison of precipitation and water need, does not relate to the variability of rainfall. For instance, in many regions in India, the excessive monsoon precipitation is balanced to such an extent by the high water need occurring at the same time that the moisture effectiveness in this season is not too different from other seasons.

The concept of precipitation effectiveness as opposed to actual precipitation registered by a rain gauge is not new, and attempts have been made by many investigators to establish relationships between precipitation and temperature with a view to obtaining indices of effective moisture. Precipitation alone cannot determine the dryness or wetness of a climate; one must know whether precipitation is greater or less than the water need. Since information on water need was not directly available, the early workers[3] made use of air temperatures to represent water need, and the precipitation effectiveness was obtained from simple ratios or differences between precipitation and temperature.[4] Köppen, in his climatic classification,[5] used formulae similar to those of Lang and de Martonne[6] for limiting his dry and wet regions. Ångström[7] in 1936 defined a humidity coefficient that was a simple modification of de Martonne's index of aridity. Thornthwaite's[8] "precipitation effectiveness" index was derived from monthly values of precipitation and temperature.

Evapotranspiration as an important parameter came into the climatological literature only in recent years and is defined as the combined loss of water by evaporation from soil and transpiration from vegetation. The actual evapotranspiration varies widely, depending on climatic factors, the nature and properties of the evaporating surface, and the amount of moisture available in the soil. In dry climates with sparse vegetation evapotranspiration is restricted by the amount of soil moisture; if more water were available, more vegetation would grow and evapotranspiration would correspondingly increase. Considerations of this sort led Thornthwaite[9] to realize that to obtain a moisture index precipitation must

[3] E. N. Transeau, "Forest Centers of Eastern America," *American Naturalist*, Vol. 39 (1905), pp. 875–889; Thomas Russel, "Depth of Evaporation in United States," *Monthly Weather Review*, Vol. 16 (1888), pp. 235–239; Massaru Isozaki, "Thornthwaite's New Classification of Climate and Its Application to the Climate of Japan," *Journal of Geography*, Tokyo Geographical Society, Vol. 45 (1933), pp. 234–245.

[4] Richard Lang, *Verwitterung und Bodenbildung als Einführung in Bodenkunde* (Stuttgart, 1920), pp. 107–123; E. de Martonne, "Areisme et Indice d'aridite," *Comptes Rendus de l'acad. des Sci.* (de Paris), Vol. 182 (1926), pp. 1395–1398.

[5] W. Köppen, *Grundriss der Klimakunde* (2d ed. of *Die Klimate der Erde*, 1923; Berlin und Leipzig, 1931).

[6] Lang, *op. cit.* and de Martonne, *op. cit.*

[7] A. Ångström, "A coefficient of humidity of general applicability," *Geografiska Annaler*, Vol. 18 (1936), pp. 245–254.

[8] C. W. Thornthwaite, "The Climates of North America according to a New Classification," *Geographical Review*, Vol. 21 (1931), pp. 633–655.

[9] Thornthwaite, H. G. Wilm, and others, "Report of the Committee on Evaporation and Transpiration," *Transactions, American Geophysical Union*, Part V (1944), p. 687.

be compared with potential evapotranspiration rather than with the actual evapotranspiration. He introduced the term potential evapotranspiration into the climatological literature in 1943. This quantity, defined as the amount of water that would evaporate and transpire from a well vegetated area if soil moisture were always available in sufficient amount for optimum use, has been found to depend primarily on the climatic properties of the region. Thornthwaite himself designed an instrument for the direct measurement of potential evapotranspiration but since it is comparatively recent there are not many places in the world where these measurements are at present being made.[10] However, the concept of potential evapotranspiration is a very useful tool which is rapidly gaining recognition among climatologists and geographers. It has formed the basis of Thornthwaite's latest rational classification of climates.[11]

By correlating mean temperature with water use at numerous places where hydrologic studies have accounted for all features of the water balance including potential evapotranspiration, Thornthwaite has arrived at a complex exponential

TABLE I

POTENTIAL EVAPOTRANSPIRATION (IN CENTIMETERS)

Station	J	F	M	A	M	J	J	A	S	O	N	D	Yearly
Gilgit	0.3	1.6	3.0	6.3	12.0	16.7	19.2	17.4	11.3	6.2	2.2	0.6	96.8
Sukkur	1.2	2.8	8.2	16.5	21.0	21.3	21.4	19.9	17.6	14.4	6.0	2.0	152.3
Cuddalore	9.3	10.9	12.3	16.8	18.9	16.9	18.2	17.1	15.8	14.7	12.0	10.0	172.9
Colombo	13.0	12.1	14.5	14.8	15.6	14.9	15.0	14.8	14.2	14.0	13.0	12.8	168.7
Port Blair	12.0	11.2	13.7	14.9	15.4	14.4	14.6	13.8	12.7	12.9	12.2	12.1	159.9
Calcutta	4.1	5.8	14.1	17.1	18.5	17.9	18.0	16.8	15.3	13.5	7.2	3.7	152.0
Rangoon	10.8	12.3	15.8	17.2	17.6	15.6	15.7	15.1	14.5	14.7	13.2	11.0	173.5
Kodaikanal	4.7	4.6	6.1	6.9	7.5	6.5	6.0	6.0	5.7	5.5	4.9	4.5	68.9

formula for evaluating daily or monthly potential evapotranspiration from the more generally available data of mean air temperature and length of the day. The whole computational procedure is carried on by the use of tablets and nomograms. The formula is still undergoing revision, and before it can be finalized a good network of potential evapotranspiration measuring stations is needed in all latitudes.

Table I gives the values of potential evapotranspiration at selected Indian stations as computed for each month of the year by means of Thornthwaite's formula. The values of potential evapotranspiration represent the monthly water need or the average quantity of water required per month to compensate for the losses through evaporation and transpiration. If potential evapotranspiration is compared with precipitation and some provision is made for the deten-

[10] J. R. Mather (ed.), "The Measurement of Potential Evapotranspiration," *Publications in Climatology, Johns Hopkins University Laboratory of Climatology*, Vol 7, No. 1 (1954), p. 225.

[11] "An Approach toward a Rational Classification of Climate," *Geographical Review*, Vol. 38 (1948), pp. 55–94.

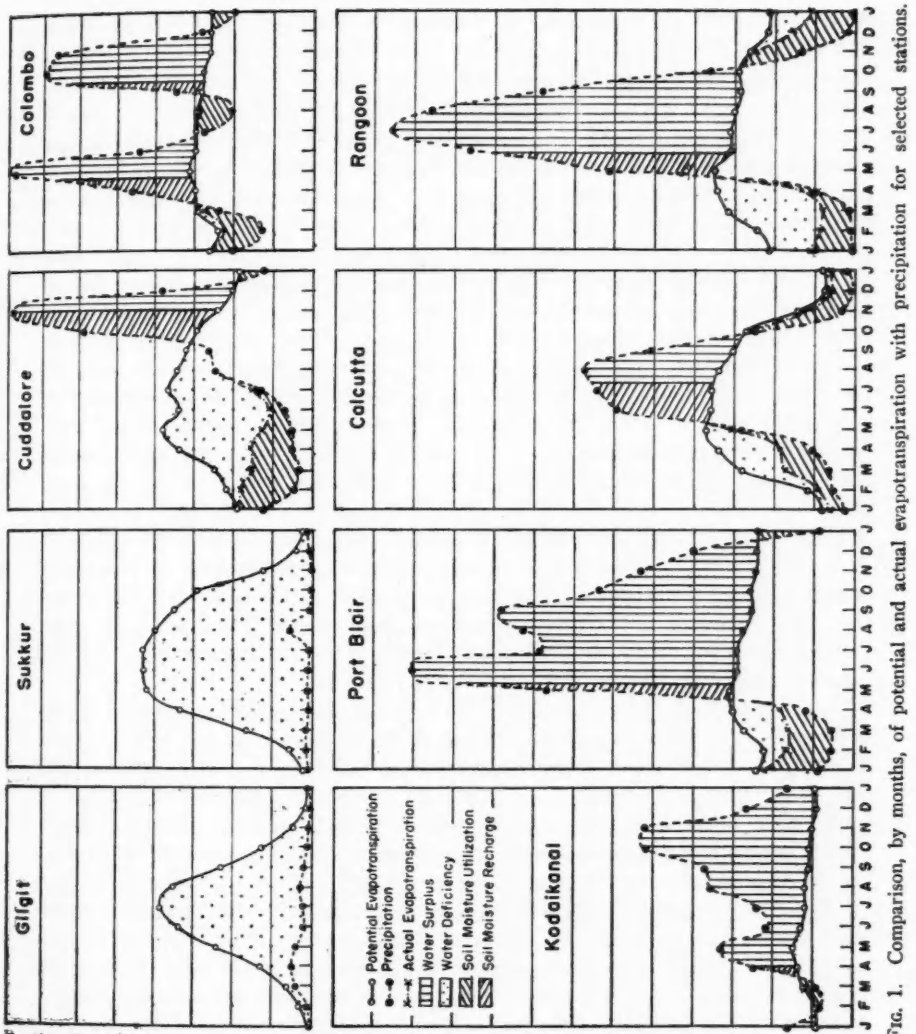

FIG. 1. Comparison, by months, of potential and actual evapotranspiration with precipitation for selected stations.

tion of moisture in the ground for use during later periods, it is possible to obtain a clearer understanding of the times of moisture deficiency and excess and the relative moistness or aridity of the climate. In those stations where precipitation in every month is greater than the potential evapotranspiration the soil always remains full of water and a water surplus S occurs. At other stations where precipitation is always less than potential evapotranspiration there is not enough water for the vegetation to use and a moisture deficit D occurs. At most stations, however, periods of moisture surplus are followed by periods of deficient precipitation during which the stored soil moisture is used, the actual evapotranspiration falls below the potential, and a moisture deficit occurs. This is followed by a period of soil moisture recharge when precipitation is in excess of water need.

To obtain actual values for moisture surplus and deficiency it is necessary to work out the water balance by use of climatological data. For such a balance sheet it was originally assumed that the soil could hold in storage in its zone of root penetration a maximum of 10 cm. of water and that this moisture would be removed from the soil at a rate equal to the potential evapotranspiration as long as any of it remained. As a result of recent work Thornthwaite[12] has modified these former assumptions in an attempt to provide a more realistic approach. Studies have indicated that the amount of moisture in a soil for use by the roots of well established vegetation on most normal soils may be at least 30 cm. and that the evapotranspiration rate is proportional to the amount of water remaining in the soil. For example, when the soil moisture is reduced to 50 percent of capacity, the actual evapotranspiration rate will be only 50 percent of the potential rate. Although the earlier assumptions gave results which are fairly comparable with those presently obtained, the new methods are preferable since they more exactly describe the physical process involved.

In Figure 1 the monthly course of potential and actual evapotranspiration is compared with the precipitation for each of the stations listed in Table I. Table II gives the actual water balance computations for four of those stations. The various operations indicated in the table are relatively straightforward although appropriate tables must be used to obtain the soil moisture storage change. Thornthwaite has a manual under preparation which will give full instructions for performing the various operations in working out the water balance.

When soil moisture is at field capacity or above, actual and potential evapotranspiration are the same and all precipitation above the water need is counted as water surplus. When precipitation falls below the water need or potential evapotranspiration, the difference is made up in part from soil moisture storage; but as the soil becomes drier the part not made up becomes larger. Actual evapotranspiration which is a function of the varying soil moisture content becomes less than the potential. This difference is the water deficit.

Thornthwaite has derived a moisture index from the relation of water sur-

[12] C. W. Thornthwaite and J. R. Mather, "The Water Budget and Its Use in Irrigation," *Yearbook of Agriculture, 1955,* United States Department of Agriculture.

TABLE II

WATER BALANCE FOR SELECTED STATIONS
(IN CENTIMETERS)

	J	F	M	A	M	J	J	A	S	O	N	D	Yearly
Sukkur													
Potential evaporation	1.2	2.8	8.2	16.5	21.0	21.3	21.4	19.9	17.6	14.4	6.0	2.0	152.3
Precipitation	0.5	0.7	0.6	0.3	0.4	0.4	0.4	2.8	0.1	0.0	0.0	0.1	6.3
Difference	-0.7	-2.1	-7.6	-16.2	-20.6	-20.9	-21.0	-17.1	-17.5	-14.4	-6.0	-1.9	
Storage change*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Actual evaporation	0.5	0.7	0.6	0.3	0.4	0.4	0.4	2.8	0.1	0.0	0.0	0.1	6.3
Water deficiency	0.7	2.1	7.6	16.2	20.6	20.9	21.0	17.1	17.5	14.4	6.0	1.9	146.0
Water surplus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calcutta													
Potential evaporation	4.1	5.8	14.1	17.1	18.5	17.9	18.0	16.8	15.3	13.5	7.2	3.7	152.0
Precipitation	1.0	2.5	3.3	5.3	14.0	29.7	32.3	33.8	25.4	12.4	1.8	0.5	162.0
Difference	-3.1	-3.3	-10.8	-11.8	-4.5	11.8	14.3	17.0	10.1	-1.1	-5.4	-3.2	
Storage change*	-2.1	-2.0	-5.4	-3.9	-1.2	11.8	11.2	0.0	0.0	-1.1	-4.8	-2.5	
Storage	19.5	17.5	12.1	8.2	7.0	18.8	30.0	30.0	30.0	28.9	24.1	21.6	
Actual evaporation	3.1	4.5	8.7	9.2	15.2	17.9	18.0	16.8	15.3	13.5	6.6	3.0	131.8
Water deficiency	1.0	1.3	5.4	7.9	3.3	0.0	0.0	0.0	0.0	0.0	0.6	0.7	20.2
Water surplus	0.0	0.0	0.0	0.0	0.0	0.0	3.1	17.0	10.1	0.0	0.0	0.0	30.2
Kodaikanal													
Potential evaporation	4.7	4.6	6.1	6.9	7.5	6.5	6.0	6.0	5.7	5.5	4.9	4.5	68.9
Precipitation	8.1	3.8	4.6	12.2	16.3	10.7	11.9	17.8	18.5	25.9	25.9	13.2	168.9
Difference	3.4	-0.8	-1.5	5.3	8.8	4.2	5.9	11.8	12.8	20.4	21.0	8.7	
Storage change*	0.0	-0.8	-1.4	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Storage	30.0	29.2	27.8	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	
Actual evaporation	4.7	4.6	6.0	6.9	7.5	6.5	6.0	6.0	5.7	5.5	4.9	4.5	68.8
Water deficiency	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Water surplus	3.4	0.0	0.0	3.1	8.8	4.2	5.9	11.8	12.8	20.4	21.0	8.7	100.1
Rangoon													
Potential evaporation	10.8	12.3	15.8	17.2	17.6	15.6	15.7	15.1	14.5	14.7	13.2	11.0	173.5
Precipitation	0.3	0.6	0.8	5.0	30.8	48.1	58.0	52.9	39.3	18.1	6.8	1.1	261.8
Difference	-10.5	-11.7	-15.0	-12.2	13.2	32.5	42.3	37.8	24.8	3.4	-6.4	-9.9	
Storage change*	-5.2	-4.0	-3.3	-1.7	13.2	13.6	0.0	0.0	0.0	0.0	-5.8	-6.8	
Storage	12.2	8.2	4.9	3.2	16.4	30.0	30.0	30.0	30.0	30.0	24.2	17.4	
Actual evaporation	5.5	4.6	4.1	6.7	17.6	15.6	15.7	15.1	14.5	14.7	12.6	7.9	134.6
Water deficiency	5.3	7.7	11.7	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.6	3.1	38.9
Water surplus	0.0	0.0	0.0	0.0	0.0	18.9	42.3	37.8	24.8	3.4	0.0	0.0	127.2

* Soil moisture utilization diminishes as the soil moisture storage becomes less.

plus, deficit, and need, all three quantities expressed on an annual basis. This index is used as the basis for the delimitation of climatic regions.

From Figure 1 it can be seen that Gilgit and Sukkur have such low amounts of precipitation that in no month of the year are the water needs satisfied; they have therefore permanent drought conditions. At Colombo and Kodaikanal, on the other hand, precipitation is large in nearly all months and essentially no water deficiency occurs in any season. As a result of seasonal variations in rainfall, Cuddalore and Calcutta show periods of moisture surplus in winter and summer respectively and water deficit at other times.

When the data used are climatic normals for long periods of time, the water balance computations give only an average picture and cannot be expected to

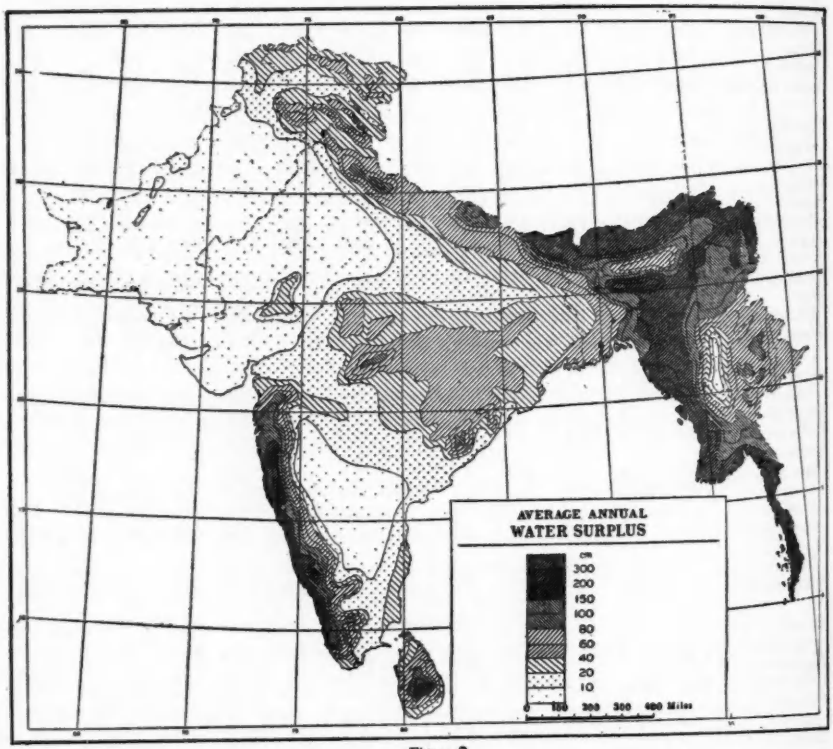

Figure 2

apply to any individual month of a particular year. If more detailed information is desired it is possible to work out the water balance for any individual year on either a daily or monthly basis using the appropriate data.

Although only the climatological data of temperature and precipitation are required, the Thornthwaite water balance method results in quantitative estimates of water deficiency and water surplus, two critical aspects of the water situation

in India and vicinity. Water balances have been computed for more than 240 climatological stations in the sub-continental region so that maps of the average annual water surplus and deficiency could be drawn following the interpolation methods of Carter.[18]

In Figure 2 the average annual water surplus of India and vicinity is shown. The principal feature of the water surplus distribution is the great maximum in certain rather large regions which contribute practically all the stream discharge of the sub-continent. The Western Ghats in South India which have considerable surplus provide the headwaters of the prominent river systems of Kistna and Godavari. Another surplus area along the Karnataka feeds the Kauveri and its tributaries; the remainder of the peninsula has no significant reliable surplus.

On the southern slopes of the Himalayas and the Khasi Hills of Assam surpluses attain almost incredible values. Cherrapunji, for instance, has a value of more than a thousand centimeters and large surpluses are known to occur on the Western Himalayas, but paucity of climatological stations makes it difficult to assign representative figures for these areas.

Special mention must be made of the great water surplus along the coasts of Eastern Pakistan and Burma. It is one of the distinguishing features of streams entering the eastern part of the Bay of Bengal that they encounter progressively more and more surplus as they flow. The lower reaches of the streams have enormous amounts of water to transport.

No appreciable moisture surpluses are encountered elsewhere in India and vicinity; the whole of the northwest, Rajasthan, Sind, Punjab and Baluchistan, has almost no surplus. Interestingly, much of the Indo-Gangetic plain is without a significant water surplus although the Ganges receives appreciable contributions from the land it traverses near its delta.

By far the most spectacular feature of the surplus in nearly all parts of India is its striking seasonality. Enormous water surpluses follow a drought season of at least two months' duration over most of northern India and vicinity. On the coasts of Burma, at Gwa, for example, the drought season lasts from November to April and although the southwest monsoon arrives in May, there is only a slight surplus during May. Thus at Gwa, the main water surplus occurs in June, July, and August, with approximately 100 centimeters accumulating each month. Elsewhere in northern and central India, the main surplus occurs somewhat later, well after the arrival of the southwest monsoon. Figure 1 shows that water surplus is not large in Calcutta until August although the moist season begins during June. It is a persistent feature of the surplus regime of northern and central India that large surpluses do not occur until at least a month after the arrival of the southwest monsoon.

[18] D. B. Carter, "Climates of Africa and India according to Thornthwaite's 1948 Classification," *Publications in Climatology, Johns Hopkins University Laboratory of Climatology*, Vol. 7, No. 4 (1954), pp. 453–474.

More specific information on the amounts of surplus of a particular drainage in a given year or on the probability of attaining certain amounts of surplus in a specific time interval can be obtained by using the appropriate climatological data. Thus the Thornthwaite water balance method provides the means for estimating a variety of hydrologic parameters used in flood analysis and planning the utilization of seasonal water supplies, but, in order to have a clear insight into

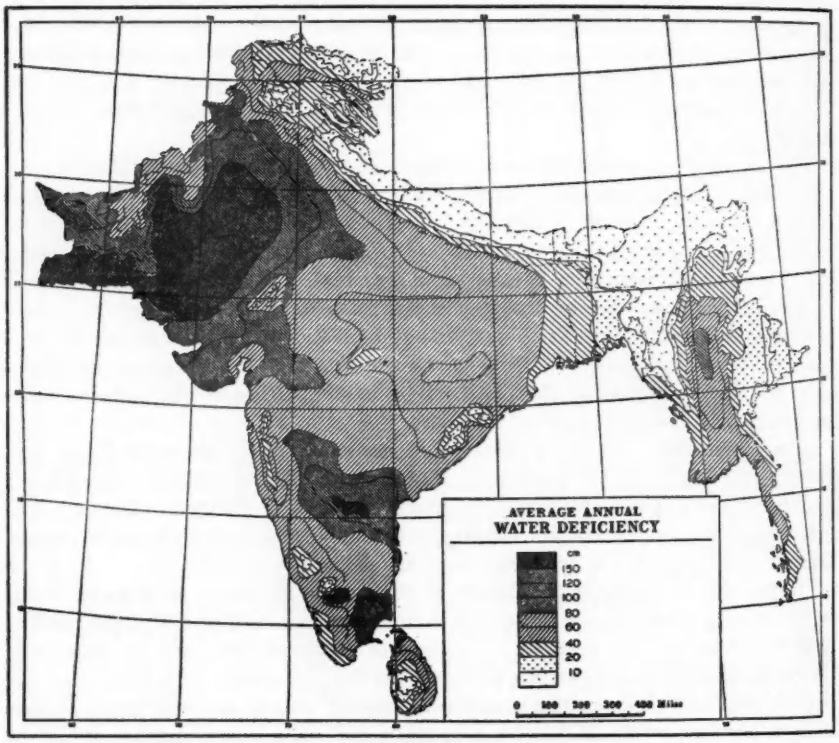

Figure 3

moisture problems of the Indian region, the water deficiency must also be examined.

Figure 3 presents the distribution of water deficiency for India and vicinity on the same scale as the water surplus given previously. The most prominent features of the water deficiency map are the rather larger amounts of deficit which extend to those areas represented above as having considerable water surplus. This apparent paradox is, of course, the result of seasonal contrasts because large deficits and large surpluses alternate at many stations.

The region with the greatest water deficiency shown in Figure 3 is in the

northwest, including the main areas of Rajasthan, Punjab, and the whole of Baluchistan in the west. While the Rajasthan desert with a maximum deficiency of nearly 150 cm. forms the heart of this deficit region, there are also large deficiencies extending far into central India. Moreover, there are reasonably large deficits in the Kistna basin and the central Irrawaddy valley. For example, Bellary has an annual water deficiency of 125 cm. and virtually all nearby lowlands of southern India have deficiencies of at least 50 to 80 cm.

Water deficit is not confined to the continuously arid regions but occurs seasonally elsewhere throughout the area except at well watered highland stations where water need is meager. For example, there are deficiencies of 94 cm. at Peshawar and 24 cm. at Srinagar in the very headwarters of the Indus drainage. Even the coastal strip of the Arabian Sea has large deficiencies; Bombay with an annual rainfall of nearly 200 cm. has a water deficiency of almost 60 cm. Similar deficits are found throughout the Ganges plain. Thus, the water deficiency map reveals the precarious nature of the water balance in many of the best agricultural districts of the sub-continent. The impact of these deficiencies on the local economy is rendered more serious by the excessive variability of monsoonal rainfall, and, as Kenneth Hare aptly says,[14] ". . . peninsular India constitutes one of the zones of supreme climatic hazard; in few other places is large scale governmental action more strongly needed to reinforce the efforts of the populace in water conservation."

The moisture regime of the country as a whole can be studied by considering another important climatic element, the moisture index, which on an arbitrary scale, weighs the water surplus and the deficiency against the water need. The moisture index map prepared according to Thornthwaite's scheme is shown in Figure 4 where positive indices indicate moist climates and negative values show dry regions. Moist climates according to this definition are found only in certain restricted portions of the country. A continuous strip of moist climates is on the west coast of the peninsula extending inland almost beyond the eastern slopes of the Western Ghats. Although indices are seen to vary to some extent, humid conditions exist on the high grounds of the interior Deccan. The largest area of very moist climates includes the Himalayan slopes and the high mountains of the northeast. The Gangetic plain and Bengal too have significant positive moisture indices.

The driest region is in the northwest and arid conditions also extend through the Rajasthan into the Indus valley and westward into the basins and plateaus of Baluchistan. From this dry core, semiarid and dry subhumid climates extend eastward into the Ganges plain and towards Deccan in the southeast; only in the Aravalli hills is there a small humid section. The belt of dry climates from the northwest to southeast is more or less a dividing zone between the humid climates of the west coast and those of the central and eastern portions of the country.

[14] F. K. Hare, unpublished article.

The Deccan plateau too is mostly semiarid. A very interesting feature is the fully arid condition of certain parts of the Kistna basin.

From the distribution of the moisture parameters shown in Figures 2, 3, and 4 it is possible to obtain considerable information on the moisture problems of the Indian sub-continent. India has many areas of extreme water surplus and at the same time equally large areas of severe water deficiency. Thus there are two problems confronting the country—one is concerned with the almost dry

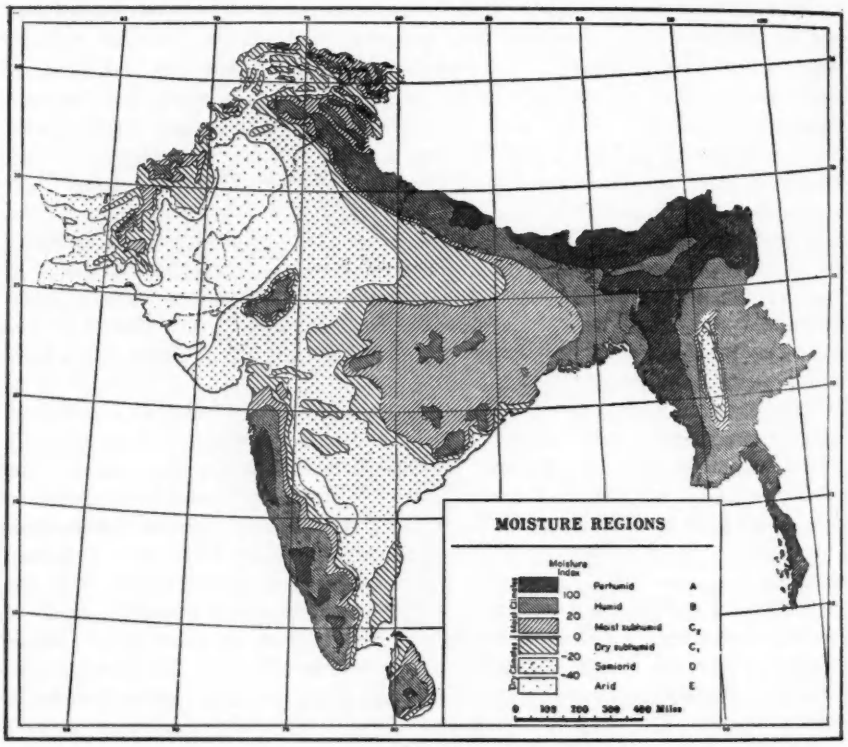

Figure 4

pre-monsoon period or the continual period of drought in western India when there is not enough moisture in the ground for the use of vegetation and the other is concerned with the wastage of the excess precipitation during the monsoon season. The former is a problem for the agriculturalist and its solution lies in the conservation of water and the use of supplemental irrigation while the latter is a problem for the hydrologist and involves adequate drainage and flood protection facilities as well as programs for the storage and utilization of flood waters.

Droughts are permanent features of arid climates, as the conditions at Sukkur in Figure 1 attest. In semiarid and subhumid locations, such as Cuddalore represents, drought is a reliable seasonal characteristic alternating with periods of adequate or surplus moisture. The humid regions have a prevailing surplus condition but drought occurs intermittently when precipitation is inadequate in time or amount to sustain immediate moisture needs, as, for example, when the monsoon fails. To overcome any of these types of drought, irrigation is required.

The water balance method of determining water deficiency is a powerful tool for irrigation; it not only can indicate when moisture is needed but it also provides information on how much to apply in order to satisfy needs without profligate waste. Rubey[15] states that this method is the most accurate so far known for determining the times and amounts of irrigations.

In a region such as India where drought and water surplus are both great problems, where water conservation is urgent and the need for irrigation ubiquitous, the water balance method offers a firm basis for appraising the problems in the planning stage and it provides a sound means for determining proper practices on a day-to-day basis. As Thornthwaite[16] has said, "Because now we are able to set up such a balance through the concept of potential evapotranspiration, we may at last introduce an element of science into the ancient agricultural art."

[15] H. Rubey, *Supplemental Irrigation for Eastern United States* (Danville, Illinois: Interstate, 1954), pp. 90–91.

[16] C. W. Thornthwaite, "The Water Balance in Arid and Semi-arid Climates," *Proceedings International Symposium on Desert Research* (Jerusalem, 1952).

CIRCULATION AND SETTLEMENT PATTERNS OF THE CALUMET REGION OF NORTHWEST INDIANA AND NORTHEAST ILLINOIS

(THE SECOND STAGE OF OCCUPANCE—PIONEER SETTLER AND SUBSISTENCE ECONOMY, 1830–1850)

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THIS paper is a sequel to the one initially presented on the first stage of occupance of the Calumet region, that of the Pottawatomie and Fur Trader, —1830.[1] Its purpose is to show how the pioneer settler and his subsistence economy of the period of 1830–50 originally supplemented and then gradually supplanted the occupance forms of the Indian and the French fur trader. It is the second of a series of four proposed papers designed to explore the role that each of four occupance stages successively played in the evolution of the modern Calumet region.[2]

To gain an intelligible time and space perspective of Calumet pioneer regional development, several types of source material and techniques were used: (1) compilation of original land survey; (2) review of relevant historical and contemporary documents and map material (some of it in unpublished form); (3) examination of field evidence in terms of present-day–pioneer-day relationships; (4) graphic spatial portrayal of as many environmental features as practicable. The environmental elements and their relationships are featured in the form of a master map (Fig. 1) which exhibits the coherent ensemble of basic physical and cultural phenomena, and a sequent occupance chart (Fig. 2) which reveals chronologic-chorographic relationships of the landscape elements most germane to our discussion.[3]

[1] Alfred H. Meyer, "Circulation and Settlement Patterns of the Calumet Region of Northwest Indiana and Northeast Illinois (The First Stage of Occupance—The Pottawatomie and the Fur Trader, —1830)," *Annals*, Association of American Geographers, Vol. XLIV, No. 3 (Sept. 1954), pp. 245–274. Like the first, this second paper was read before the Association of American Geographers.

[2] The Calumet region is a compage of the nodal type, circulation in and out of the Chicago area being the criterion of homogeneity. Already in the days of Fort Dearborn (1804–35) the major traffic routes converged on Chicago. The Calumet region is divisible into two districts: (1) the earliest settled Indiana section, dominantly timbered, with the district trading in pioneer days centered on Michigan City; (2) the Illinois section, dominantly prairie, with its pioneer trade focused on Chicago. The state line coincidentally conforms to the zone of transition of the two districts. For the coinage and use of these terms, as proposed by Derwent Whittlesey, see P. E. James and Clarence F. Jones (eds.), "The Regional Concept and the Regional Method," *American Geography: Inventory and Prospect* (Syracuse University Press, 1954), pp. 21–70.

[3] The theory behind this form of presentation is that if we want to depict and interpret the environmental ensemble of a region correctly, we must keep our eyes fixed on *the way*

FACTORS RETARDING PIONEER CIRCULATION AND SETTLEMENT

Location of the Calumet region at the head of Lake Michigan, the southwestern-most extension of the Great Lakes, has been a strategic factor in modern times in directing millions of people to or through the area. Yet pioneer settlement of the region came comparatively late. The explanation for this retarded occupance must be sought in a number of geo-historic factors: Though the cul-de-sac feature of the lake was already significant in the Indian occupance stage in leading the early French and other explorers and trappers round about the southern extremity of the lake, the full import of this phenomenon did not become apparent until settlers came to occupy or traverse the southern part of the Great Lakes territory.

Among the factors retarding settlement were the following:

1. Indians were in possession of the Calumet as late as 1832–33, when the federal government negotiated a treaty with the Pottawatomi providing for their removal to a reservation in Kansas. Even then some of the Indians remained on small reservations or roamed around throughout the entire pioneer period.

2. During the pioneer period a considerable part of the natural environment was decidedly unfavorable to circulation and settlement. One-third of the area was covered with dense timber awaiting clearing. Much of the remaining prairie was too wet to cultivate. The east-west orientation of the deep Calumet marshes made approach to Lake Michigan from the south extremely difficult. But an even greater barrier to travel headed for the lake was the east-west marshes flanking the Kankakee River immediately south of the Calumet area. The Indiana legislature was determined to build a road—the so-called Michigan Road—from Indianapolis directly across the Kankakee Marsh to Michigan City, the Calumet lake port; but a subsequent survey led to the abandonment of this plan.

3. Although enthusiasm waxed strong for the development of the Michigan City port, neither it nor any other site at the head of the lake presented an ideal natural harbor site.

4. Although navigable streams often aided pioneer settlement in other regions, the notorious rambling of the Grand Calumet and Little Calumet rivers, and the impassable marshes flanking them, made them relatively useless for transportation.

5. The Illinois and Michigan Canal, crossing the area in the northwest, was not completed until near the close of the pioneer period (1848).

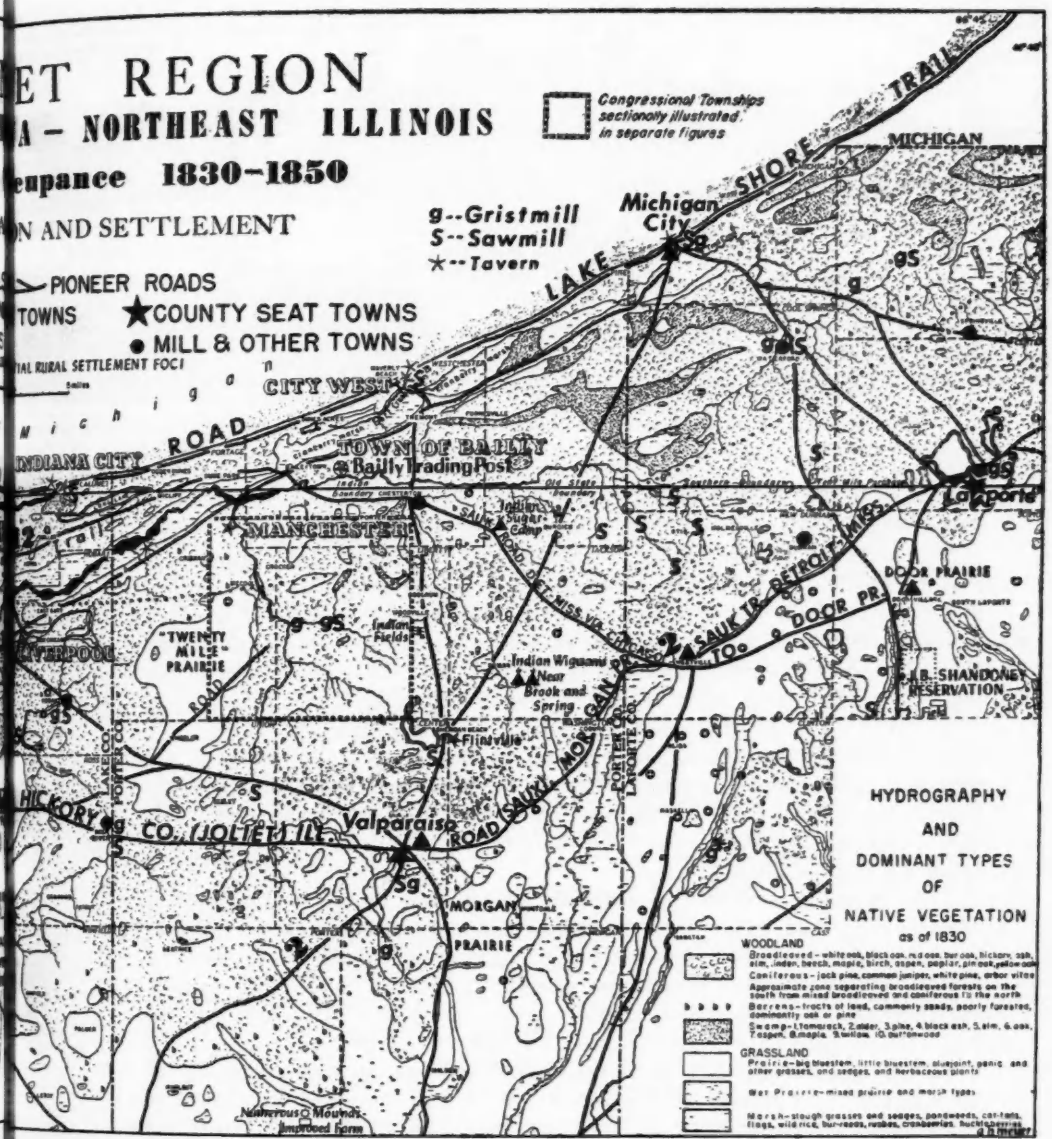
6. Finally, railroads did not enter the region until after the close of the pioneer period—1851.

OTHER FACTORS RELATED TO TEMPORARY AND PERMANENT SETTLEMENT

Despite the handicaps mentioned above, a number of events in the early thirties encouraged migration into or through the region. The Michigan City port was

things actually occur together. True space and time relationships are often lost sight of when classified data are presented on separate maps, with the result that one may very well question the validity of certain correlations, generalizations, and other conclusions drawn therefrom.

FIG. 1. A sequel to the Pottawatomie occupance map of the preceding period, this map is designed to show elements of the natural environment (vegetation and hydrography) to which they were most closely related. orient the reader and to illustrate how the forms of present-day circulation and settlement are "vestigially"



sential elements of heritage of that period as well as the cohesive relationships of pioneer occupance forms to those atures are superimposed on a modern base map of townships, towns, and some of the leading thoroughfares to the past.

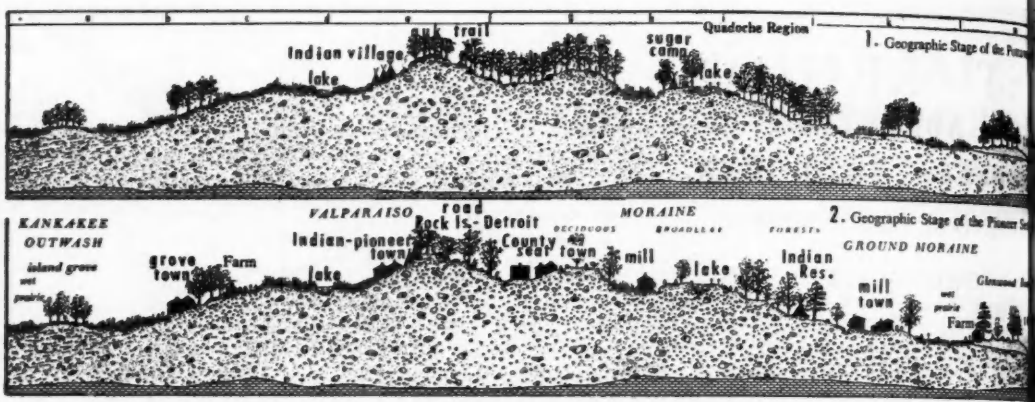
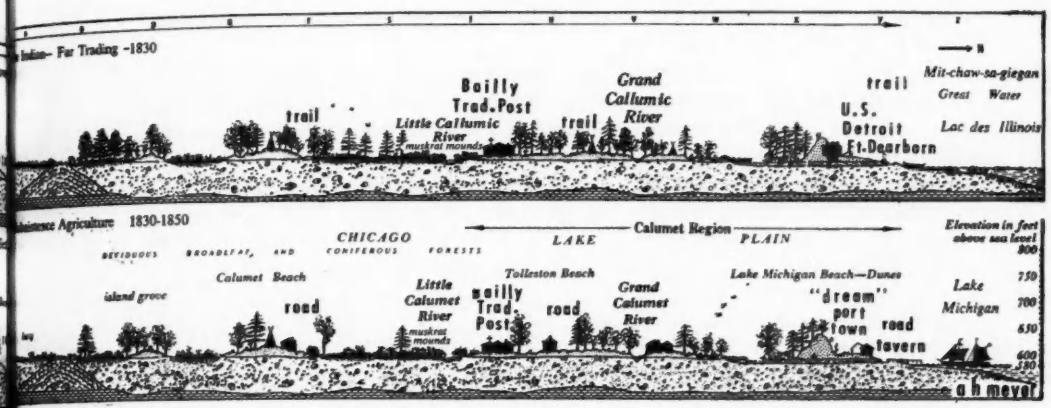


FIG. 2. Supplementing Figure 1, these skyline silhouette sketches are intended to portray synthesized patterns of the Calumet compage.

established in 1831. The Michigan Road, bypassing the Kankakee marshes, was completed in 1833, and central Indiana communities like Indianapolis and Logansport were connected with the port. It was by this route that many settlers came into the Calumet from southern Indiana and from Kentucky and states farther south. In the same year, the first stage line was opened. It followed the Fort Dearborn-Detroit Trail about the shore of Lake Michigan from Michigan City to Chicago. Along this shore route and on the Old Sauk Trail a few miles to the south on the Valparaiso Moraine came immigrants from Ohio, Pennsylvania, and New York. Immigrants from abroad—Irish, Germans, English, Swiss, Norwegians, and Swedes—also entered the area by these routes. Settlement of the west side of the Calumet was facilitated by the Vincennes Trail (or Hubbard's Trace) which linked historic Vincennes, the oldest Indiana community, with Chicago. (For the trail-road pattern and other regional features referred to in this paper, see Figures 1 and 2.)

Local county historical data definitely indicate that the Pottawatomie trails were the first routes followed by the pioneer into and through the area. Records are not available, however, for showing cartographically the first roads built by the pioneer himself, independent of the trails, except for a few "spurs" that extended out from them, as noted on several of the government plats. These have been incorporated in the Figure 1 map (ex: at "Twenty-Mile" Prairie).

The geographic character of the transformed trail-road pattern and its use by the immigrant and traveler of this period may best be illustrated with reference to the chief alternate arterial routes of travel across the area between Detroit and Chicago (Fort Dearborn). Traffic from Detroit to Chicago during the early pioneer period followed one or another of several routes through the Calumet region: (1) It entered the region on the Lake Michigan beach and continued thereon all



and-life relationships in the context of both space and time for each of the major physiographic units included in

the way to Fort Dearborn. (2) It entered the region at LaPorte on the Old Sauk Trail and followed one of the Indian trail branches and finally the main stem of Trail Creek Trail to Michigan City and then the Lake Shore Trail to Fort Dearborn. (3) It continued farther west on the Old Sauk Trail from LaPorte to Westville and then headed for the Lake Shore Trail by an Indian trail across Jackson and Westchester townships to the vicinity of Baileytown. In the latter part of the period the Lake Shore Trail was mostly avoided because of its loose beach sand and several new routes were followed: From Michigan westward one route coincided with the ancient Calumet and Tolleston beaches (now essentially routes U.S. 12 and 20) through the sites of modern Gary, Hammond, and Calumet City, then turned northward and intersected the Lake Shore Trail at the site of modern South Chicago, or continued westward to Blue Island and then via Vincennes Trail northward to Fort Dearborn. Another major thoroughfare followed the ancient Calumet Beach south of the Little Calumet River via Baileytown, Liverpool, and modern sites of Highland, Munster, and Lansing (modern highways U.S. 6 and U.S. 41) to Thornton or to the Vincennes Trail, thence turned northward to Chicago via Blue Island.

Reference to pioneer road nomenclature has often proved confusing when, for example, description of the Old Chicago Road by one author does not coincide with that of another, and may designate any one of the routes indicated above. Still greater confusion results when certain early chronicles refer to the Vincennes Trace also as the Old Chicago Road. Thus, the matter of identifying roads, so baffling in the maze of the modern transportation pattern of the Calumet-Chicago area, seems already at this primitive period of travel and settlement to have presented a problem.

But the greater circulation problem was the road itself. Regardless of their course and destination, the first white man's traffic ways were literally Indian

trails, often identified merely by naturally favorable routes of travel rather than defined by specific human markings.

The first major thoroughfare of the Calumet was the Lake Shore road, with one or another of the eastern approaches as indicated above. Its initial function was to connect Fort Dearborn for military and mail service. Over it came the military expeditions assigned to build and defend Fort Dearborn. It was much used for the transportation of troops during the Black Hawk War, and it was the first route in the Calumet used by the pioneer who sought a new home in the Calumet or whose ox-drawn caravan was headed for some more distant land in the West. In 1831 a mail route was established between Detroit and Fort Dearborn which followed this route. For two years the mail was carried on the backs of the soldiers. This laborious method was superseded by stage coaches in 1833, when the mails were carried along this road three times a week.[4]

The Lake shore was the line of least resistance to pioneer travel: "The firmly packed sand; absence of obstructions as falling trees, impassable ravines and deep rivers made it an ideal roadway for the heavy wagons of the pioneers."[5] But those familiar with modern Lake Michigan beach deposits will wonder how the lumbering Conestoga wagon plowed through the beach sand where it was not compacted by the waves, and how the wagons forded the two mouths of the Grand Kalamick, since there were at first no bridges or even ferries. There was a ferry near the mouth of the Calumet as early as 1830 but no bridge until 1839.[6]

The following narrative from *Travels of James H. Luther in 1834, 1835, and 1836* illustrates what early pioneer experiences were like in travelling the Lake shore:

> I, in company with the Cutler boys of LaPorte County, travelled with ox teams upon the beach from near where Indiana City was afterwards built to Chicago, and Fox River, Illinois, which was then called Indiana Country, was surveyed, and occupied by Aborigines. Our object was to make claims and secure farms.
>
> We returned in the spring of 1835 for teams and supplies. After the grass had grown so that our cattle could subsist upon it, we, with an elderly gentleman from Virginia, by the name of Gillilan, who had a large family of girls, three horses, a "schooner wagon" filled full, started west, and this time struck the beach at Michigan City. Our first camp was on the beach where, back of the sand ridge, were extensive marsh lands with abundant grass, upon which we turned our cattle consisting of eight yoke of oxen and one cow.

In the morning one of their oxen was missing. They found him mired in the marsh and "almost out of sight." They succeeded in getting his legs out of the mire and then rolled him about five rods to ground upon which he could stand: "We only made about three miles on our way that day. We finally reached the Calumet, now South Chicago, without further accident . . . and went into camp."[7]

[4] Roy Gunder, "Roads and Railways of Westchester Township, Porter County," MS, Porter County Historical Society.

[5] *Ibid.*

[6] Rollo B. Oglesbee and Albert Hale, *History of Michigan City, Indiana* (Edward J. Widdell, 1908).

Concerning the difficulties along this route, one writer says:

> The trail along the lake shore was not very satisfactory on account of the deep sand and the streams coming into the lake, viz: Fort Creek, east of the mouth of the Calumet River, Wolf River and the west mouth of the Calumet River."[8]

Another writer observes:

> The river itself was unfordable but where it debouched into the lake the combined action of river and lake currents had caused a sandbar to be built up beneath the water of the lake on which it was possible for a driver who knew the way to pass around the mouth of the stream. Since the location of the bar was continually shifting, however, and since strangers could not in any event be familiar with it, this excursion into the waters of Lake Michigan was always an adventure of no slight consequence.[9]

Impressive indeed must have been the view of the Conestoga caravan trailing along on the narrow beach of glistening sand between the lofty Indiana Dunes and the lake shore. Such an experience from a vantage point in the dunes is described as follows:

> The next singular scene was an expanse of sand, before reaching the lake-shore,—sand, so extensive, hot, and dazzling, as to realize very fairly one's conceptions of the middle of the Great Desert; except for the trailing roses which skirted it. . . . I had ploughed my way through the ankle-deep sand till I was much heated, and turned in hope of meeting a breath of wind. At the moment the cavalcade came slowly into view from behind the hills; the labouring horses, the listless walkers, and smoothly rolling vehicles, all painted absolutely black against the dazzling sand. It was as good as being in Arabia. For cavalcade, one might read caravan. Then the horses were watered at a single house on the beach; and we proceeded on the best part of our day's journey, a ride of seven miles on the hard sand of the beach, actually in the lapping waves.[10]

Adventurous and expeditious as was such a route for a "natural" road, it did not seem to be one which could be relied upon at different seasons of the year, since a change in weather affected terrain, stream, and shore conditions of travel. A contemporary of the period is reported as having said that "the beach road from Michigan City to Chicago was just splendid when it was all right and could be travelled in six hours, but it was just horrible when it was all wrong, in dry weather, and took six days."[11] And so, by about 1837 the stage abandoned the Lake shore route for a route one to five miles inland from the lake, which almost throughout its whole course follows another beach way, the so-called Calumet and Tolleston beaches of Old Lake Chicago, antecedent to modern Lake Michigan. It was the forerunner of our modern Dunes Highway (U.S. 12 and U.S. 20).

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[7] Thomas Horton Ball, *Northwestern Indiana from 1800 to 1900* (Chicago: Donohue and Henneberry, 1900), pp. 356–357.

[8] Emma Leah Teeter, "Indians and Indian Trails, LaPorte, Indiana." Unpublished typewritten MS in LaPorte City Library.

[9] Milo Milton Quaife, *Chicago's Highways Old and New* (D. F. Keller & Co., 1923), p. 45.

[10] Samuel J. Taylor, "Michigan City in 1836," *Society in America*, Vol. 1 (1837), pp. 256–257. This tract reproduces an account of western stage travel by Harriet Martineau from Detroit to Chicago, starting June 15, 1836.

[11] Oglesbee, *op. cit.*, p. 207.

High and dry, this "beach" ridge road afforded a naturally favored route across the Lake Chicago region.

Although squatters started to enter the region in 1830, the tide of immigration did not get under way until shortly after 1835. The federal government had by this time completed the sectional survey of the area and established a land office at LaPorte for the purpose of conducting land sales.[12]

Many of the original land purchasers were squatters who had pre-empted their claims simply on the basis of prior settlement, or by the nominal purchase of a so-called Indian "float." Under the treaty with the Pottawatomie Nation in 1832, whereby the Indians ceded their lands to the federal government, certificates commonly called "floats" were issued to certain Indians which granted title to specific sections or quarter-sections of land.

Already at this early date non-resident land speculators were attracted to the area and tried to outbid the squatters, who organized a "Squatters Union" to defend the settlers' rights against the speculator intent on buying large tracts of land at prices the local squatter was not able to pay.

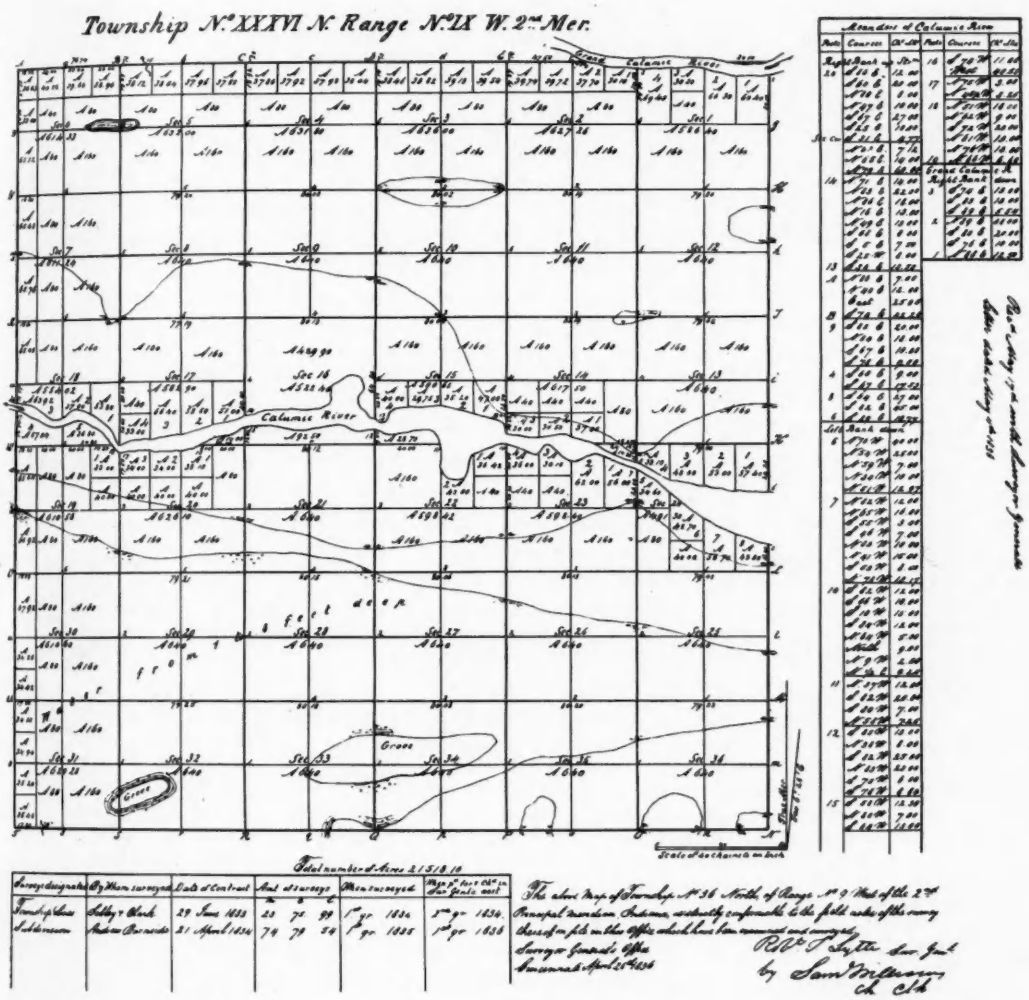
Many of the squatters themselves did not remain long in the area. The Calumet was characteristically a transit area, and it appears from all accounts of this period that streams of migrants from the East passed through the area headed for points farther west. The more restless Calumet residents often joined the west-bound Conestoga caravans.

The general settlement pattern of the Calumet evolved from east to west. In the easternmost part of the area we have the first urban communities of prominence —Michigan City and LaPorte. Here also we have the first clusters of rural settlements—those on the margin of Door Prairie, and then on Morgan Prairie (note prairie sections in southeast area, Fig. 1). County and township governments likewise were organized first in LaPorte, then Porter, then Lake, and then Cook and Will counties on the Illinois side of the Calumet.

Many of the settlers were content to locate immediately next to or near the Indian trails by which they had entered the region. These trails characteristically followed the higher and dryer land and for almost the entire pioneer period constituted the chief routes of travel throughout the area.

The Calumet pioneer showed preference for settlement in or near timber. The timber sheltered him from the winter winds; it provided an abundance of firewood, building, and fencing material. Moreover, psycho-geographic factors often were a deciding issue. Thus one observer notes:

[12] The survey followed the pattern prescribed by the Ordinance of 1785, as illustrated in the fascimile of Figure 3—Congressional townships six miles square, marked off into 36 sections each a mile square, with east-west, north-south roads eventually to be constructed along the section lines. The sections in turn were divided into quarters, a convenient arrangement in selling the land, and, as it turned out, in managing a farm as well, since a quarter section commonly was found to be just about the size an average farm family could afford to own and to operate. Once the section line roads were laid out, which did not occur in a major way until the beginning of the next period (after 1850), the pattern of sectional farmstead distribution evolved much as we know it today.


Township N.° XXXVI N. Range N.° IX W. 2.nd Mer.
Calumet River
Grove
Grove
Ascendant of Calumet River
Right Bank
Left Bank
Grand Calumet R.
Right Bank
Scale of Six Chains to an Inch
Total number of Acres 21518.16
The above Map of Township N.° 36 North of Range N.° 9 West of the 2.d Principal meridian Indiana, is truly conformable to the field notes of the survey thereof on file in this office and is hereby approved and accepted
Surveyor General's Office
Surveyed April 1834
R.W.d J. Spotts Surv. Gen.l
by Sam.l McKeen
Ch. Clk
Robt. J. Spotts Sy.

Surveys designated	By Whom surveyed	Date of Contract	Amt. of surveys	Time surveyed	Maps & field notes returned to Genl. office
Township lines	Sidney Breck	29 June 1833	23 77 99	1st qr 1834	1st qr 1834
Subdivision	Andrew Brunson	21 April 1834	74 79 54	1st qr 1835	1st qr 1835

FIG. 3. Facsimile of a government survey plat. Such elemental data, together with field notes, provide invaluable original and unpublished source material for Figures 1, 5, and 6.

> When the two counties [Lake and Porter] were first settled, the wooded islands and the timbered uplands, with their clayey and sandy soils, were considered more valuable than the prairies. The settlers had come from well-timbered countries and had the erroneous belief that land that did not produce trees would not produce cereals.[13]

False as this theory was as to soil fertility, many of the Calumet prairies did present seasonal handicaps and hazards to settlement. Note particularly on the map the Cady and the Little Calumet river marshes.

> Many of the prairies, as Twenty-Mile Prairie, Whippoorwill Prairie, and much of Morgan Prairie in Porter County, and those on the northern half of the morainic region of Lake County were wet prairies, and for years yielded only swamp hay and pasture.[14]

In a dry season or in the fall, the canebrakes of the adjacent marshes and the tall grasses of the prairie presented a real fire hazard. In spite of these adverse factors, some of the prairie land was cultivated immediately, since it saved the pioneer the work of first clearing the forest. The ideal site for settlement, then, seems to have been in or near the small timber groves on the prairies, and it is to these rather than to the wide open prairie that the so-called prairie settlements have a coherent relationship. (For the types of houses the first settlers built see Figures 4a and 9.)

The various prairies and their groves which feature in early Calumet settlement are shown in cartographic and profile perspective in Figures 1 and 2. The Illinois side of the Calumet is particularly distinguished for the grove pattern of settlement. Many of the grove settlements were identified by the names of the original settler or some characteristic component of the environment (e.g., Beebe's Grove, Thorn Grove, and Raccoon Grove). The following observation indicates how the forest emigrant from the East responded to this new prairie-grove environment:

> The experiences of the pioneers in the prairie belt was [*sic*] different, in some respects from the earlier life of the settlers in the large forests of Ohio and of southern and central Indiana, for although they built their first cabins in the edges of woodlands or in groves where they had the shelter of the trees, instead of being obliged to make clearings in heavy timber, thus opening up at first a very small farm, these prairie settlers started at once the large "breaking plows," with six or more yoke of oxen attached, and could sow and plant the first summer after their arrival. They put up, free of any expense, all of the grass for hay which they could find time to mow. . . . They had at first rails to split for fences, making as they did the Virginia storm fences, and this was their heaviest work.[15]

SELF-SUFFICIENT AND SUBSISTENT RURAL FRONTIER ECONOMY

In this pioneer period of Calumet settlement the frontiersman's economy had to be practically altogether self-sufficient. In the early thirties the only urban community of consequence in Illinois north of Peoria was Galena. In Indiana, as far

[13] W. S. Blatchley, "Geology of Lake and Porter Counties, Indiana," *22nd Annual Report of the Department of Geology and Natural Resources of Indiana 1897*, p. 67.

[14] *Ibid.*, p. 67.

[15] T. H. Ball, *Encyclopedia of Genealogy and Biography of Lake County, Indiana* (The Lewis Publishing Co., 1904), p. 4.

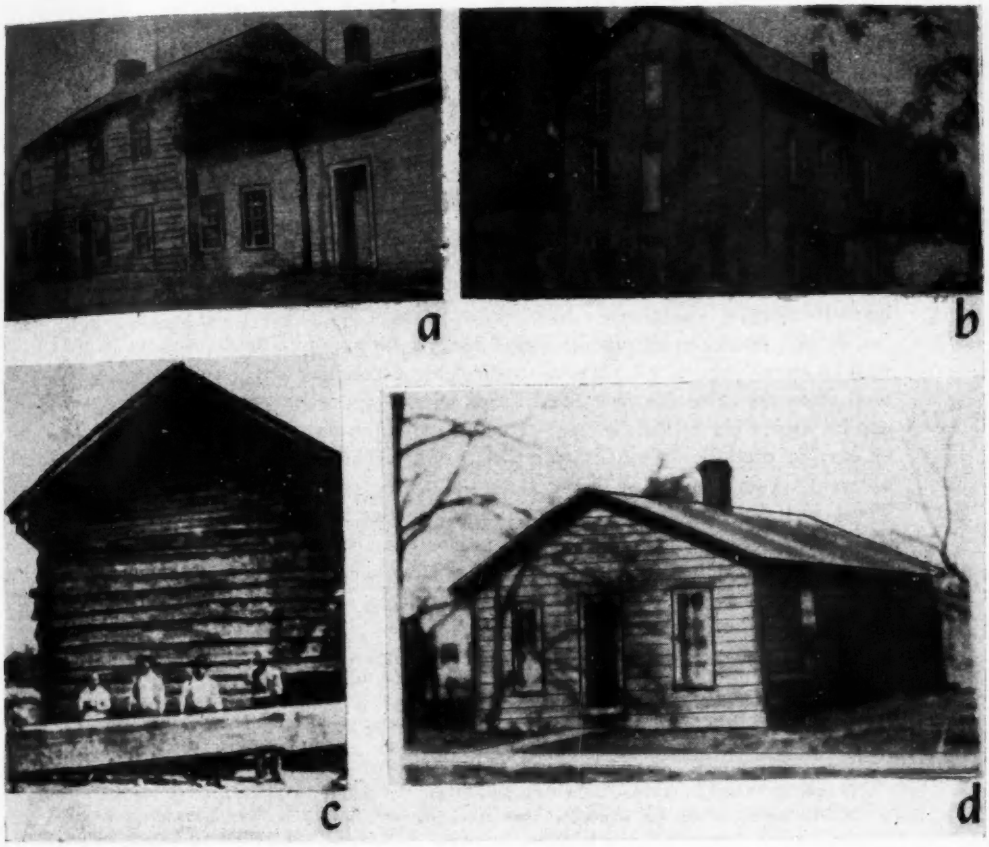


FIG. 4. Representative views of the earliest buildings in the Calumet: (a) residence of Solon Robinson at Crown Point (log structure at left); (b) Wood's Mill on Deep River; (c) and (d) first school houses at Cedar Lake and Hobart, respectively. (After Bowers *et al.* Retraced in part by author to enhance reproducibility.)

south as the Wabash River, only two urban communities were noteworthy—Fort Wayne and South Bend. The three urban communities of the Calumet area destined to become the leading trading centers in this period were Michigan City, LaPorte, and Chicago. But these were first platted in 1832, 1833, and 1834, respectively.[16]

There were then no railroads, canals, navigable rivers, nor even respectable

[16] "In 1850 Michigan City had a population of 999, ranking next in the state to Columbus, which then had as its population 1,008. At that time New Albany, the largest city in the State had of inhabitants 8,181, and Indianapolis, ranking second, 8,091." Ball, *op. cit.*, p. 123.

wagon roads by which such inland points could be reached. Lake traffic did not start till the middle thirties. The first steamboat on Lake Michigan did not appear until 1827, and it was not until 1832 that a steamboat reached the head of the lake.[17] Under such conditions of isolation each settlement had to depend upon the immediate locale for practically all food, clothing, shelter, furniture, and farm supplies.

The only form of mechanical power available for processing goods was water power, and such simple industries as the Calumet resident had were located on streams. Another factor in settlement of the Calumet, then, coheres with water power sites, where sawmills, gristmills, and carding mills were established, as hereafter noted.

Though the Calumet pioneer found himself far removed from markets in the East or South which had hitherto supplied the necessities and luxuries of life, he soon discovered that the diversified forms of land and water, and of wild life and natural vegetation of the Calumet provided a rich variety of food easy to acquire or easy to produce. From May into late fall, various wild berries maturing at different seasons were to be found on the old beach-dune ridges and in the marshes. These included wintergreen berries, whortleberries, wild currants, gooseberries, strawberries, and cranberries. The huckleberries, blue and black, included both the low-bush and high-bush types. The predominance of the cranberry in some of the marshes is noted on the original survey map where several marshes are so named (see Westchester Township, Fig. 1). Its significance as a food item in pioneer days is revealed in a number of observations of which the following is representative:

> Cranberries then grew in those long marshes in the sand hills as far east as Baileytown and on both sides of what is now the Dunes highway. Azariah Freeman owned a Cranberry farm a little south and west of what is now Wickliffe and a little south of what is now the Dunes highway, which he let out on the shares to pickers, from which farm or cranberry marsh he sometimes got three-hundred bushels a year as his share and three-hundred bushels for a man by the name of Rodman who picked them. I hauled these berries for Mr. Freeman to Valparaiso for several seasons. The prices ranged, according to supply, from fifty cents to $2.50 per bushel. These cranberries grew in a soil of wet moss and after the community became settled fires broke out during summer seasons and destroyed them.[18]

Both the large American cranberry and the small European cranberry are still found in a few local spots of the northern Calumet marsh-dunes region as relict vegetation of the fundament. Unquestionably, the near extinction of this once prolific fruit is in part due to the progressive drainage of the marshes and to fires, as noted above.

[17] "The first steamers that ever made the port of Chicago were those composing the tiny fleet which bore General Scott's army westward to the scene of the Black Hawk's War in the summer of 1832." Quaife, *op. cit.*, p. 36.

[18] Lake County Historical Association (John O. Bowers, A. C. Taylor, and Sam B. Woods, editorial committee), *History of Lake County* (Calumet Press, 1929), p. 17.

It is reported that the huckleberry also was locally harvested on a commercial scale, and the forests supplied a rich variety of fruits and nuts:

> As late as 1837 the two varieties of wild plums, the red and the yellow, were excellent in quality—the red very abundant; and of crabapples, although they were sour, yet large and nice, there was then no lack. There were nuts, too, in great abundance in the time of autumn—hazel nuts, hickory nuts, walnuts, white and black, and beech nuts.[19]

Still other native food products included the haw, wild grapes, pawpaw, sassafras, maple syrup, and wild honey. The contrasting type of forest cover, the wet and dry prairies, the marshes and swamps, the rivers and the lakes produced a great diversity of animal food and fur products. Deer were common throughout the period. The black bear was found in limited number. But the buffalo had already disappeared from the Calumet when white man came into the region. Foxes and wolves abounded and often preyed upon the pioneers' poultry and cattle.

> Of feathered animals there were wild turkeys in the heavy timber, prairie chickens or pinnated grouse in the prairies by the thousands, partridges and quails in the woods, and, in a part of the summer, wild pigeons . . . darkening the sky sometimes . . . gathering the acorns from the oak trees, and again covering large areas in the stubble of the grain fields. . . . There were also in prodigious numbers various kinds of waterfowls, wild geese, brants, swan, sand-hill cranes, ducks of many species, mudhens, and plover.[20]

The rivers and lakes were well stocked with sun fish, pike, black bass, rock bass, and other species. Among the principal animals trapped for fur were the otter, raccoon, mink, muskrat, and beaver.

Many of the squatter pioneers, like their Pottawatomie neighbors, subsisted largely on hunting, fishing, trapping, and the raising of a little corn. But once they had secured official title to their claims by purchase, clearing and cultivation of the land were energetically pursued. The region had been surveyed into townships and sections in 1834–35 and the land put on sale in 1839 at the LaPorte land office. The average farm unit, then as now, comprised a quarter section. No reference has been found to indicate on what basis the first settlers, other than the squatters, selected their tracts. It may well be that the land survey records were made available to the purchaser. If so, he could get some idea of the nature of land offered for sale, since the federal surveyor was required, among other things, to give a general description of the character of land along the section lines. Figures 5 and 6 represent a cartographic adaptation of the surveyors' plat and notebook recordings representative of timber and prairie sections of the Indiana and Illinois areas, respectively. Though, as will be noted, the survey data refer only in the most general terms to the topography, drainage conditions, quality of soil, and character of the timber or other vegetation, such information doubtless was useful both to the government and the settler. Thus in Figure 5 "marshes," "wet prairies," "swamps," and "prairie too low for cultivation" (Sec. 18) denote areas unsuited for grain farming; yet a "pine swamp" (Sec. 1) or a "cranberry marsh" (Sec. 36) might actually attract a buyer. "Level" or "rolling" used to characterize

[19] Ball, *op. cit.*, p. 17.
[20] Ball, *op. cit.*, p. 19.

the topography of nearly each section, may not take the place of a modern contour map but is certainly better than no data at all, especially when supplemented by such lay evaluations as "thin soil," "high and sandy," "poor cold soil," "level, wet and unfit," as contrasted with "dry and fit," "land level and good," "1st class." Similarly, in Figure 6, the "high," "dry," "rich" and "level" sections of the prairie

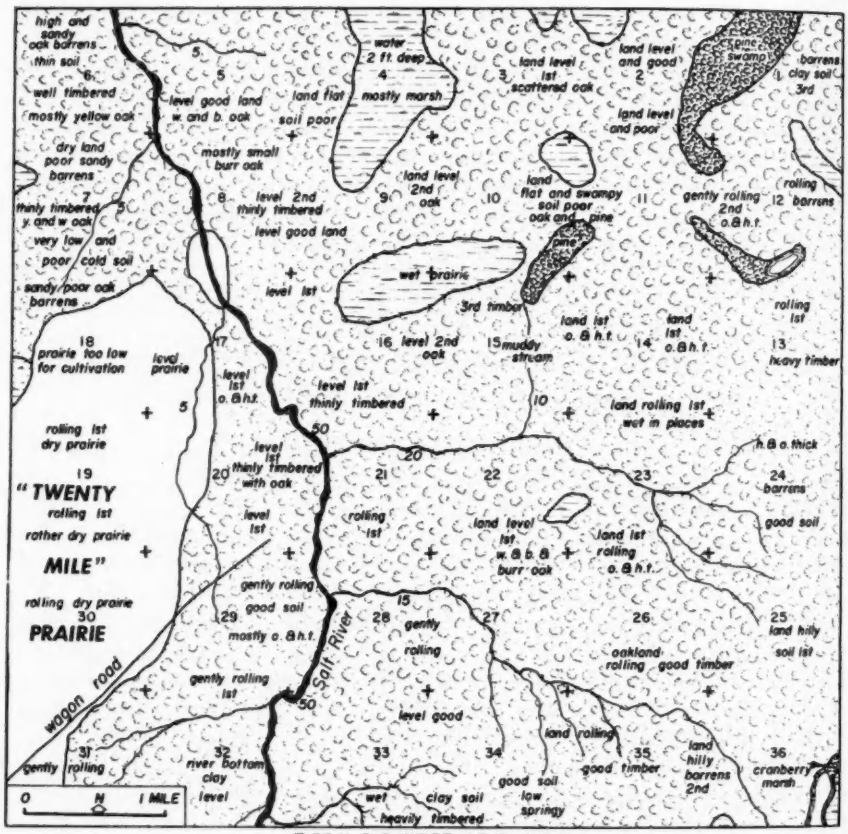


FIG. 5. A "blown-up" map of one of the congressional townships representative of the Calumet timber section, comprising today parts of Liberty, Westchester, and Portage civil townships. This and its counterpart for the Illinois prairie section (Fig. 6) were compiled from selected government survey material, such as illustrated in Figure 3.

"fit" for cultivation are areally differentiated from soils "broken," "thin," and "wet," or otherwise "unfit" for cultivation.

The timber and stream data also might well have served the sawmiller. The dominant genera of trees (here chiefly oak and hickory) were generally recorded,

with a frequent indication also as to the stand, whether "thin" or "heavy" or "barrens."[21, 22]

Survey plats of this type also frequently carry fundament occupance terms,

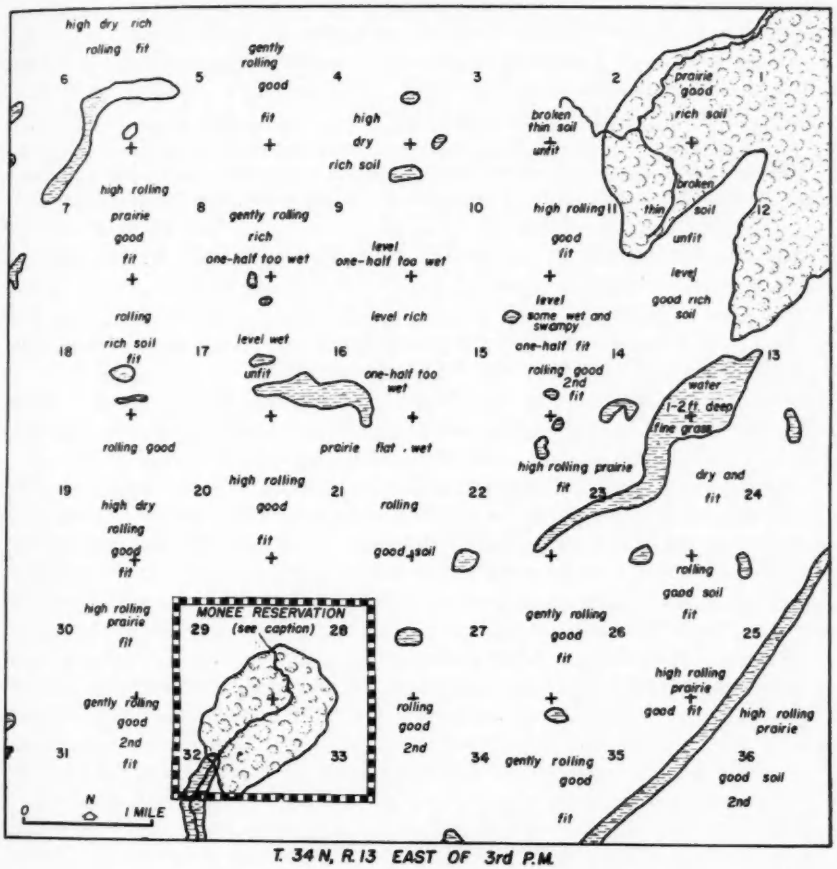


FIG. 6. The prairie counterpart of Figure 5.

such as the "Twenty-Mile" Prairie, west side inlier of a timber township in Porter County, and the "Mo-nee Reservation" in a prairie township of Will County (Fig. 1). Incidentally, each suggests an interesting geographic principle of human

[21] For the signification of this term see Alfred H. Meyer, "Fundament Vegetation of the Calumet Region, Northwest Indiana-Northeast Illinois," *Papers of the Michigan Academy of Science*, Vol. XXXVI (1950), p. 179.

[22] Finding such inventory recordings useful in geographic transect descriptions of the fundament cover, the author utilized such data in composing a master survey map—too detailed, however, to reproduce here.

occupance. "Twenty-Mile" signified the distance to the nearest market (Michigan City), critically important in a pioneer wilderness. And as for the reservation, both Indian and white would find a grove site with a stream coursing through it a most preferred habitat. A toponymic relict, the Mo-nee Reservation, also explains why the township and a community in the area carry the name Monee.

As has been noted previously, timber cover generally attracted the settler who did not mind clearing it.

> Strange as it may seem, land was actually *cleared* for agricultural purposes; though just outside and adjoining were thousands of acres better adapted for farming than the land thus laboriously prepared for the plow; but then they had seen it done so in the East or South, from whence they had come, and the prairie would have been an experiment, and they had no time or disposition to try it.[23]

Only the crudest type of agricultural implements were available for breaking up the land and cultivating crops:

> The plows used by these sturdy honest pioneers consisted of wooden moldboards, iron shares, and home-made stocks and beams. Each pioneer had his own mechanic and usually made all the woodwork for the farming implements.[24]

Harrows were of the most primitive type, with wooden teeth. There were no riding cultivators, mowers, reapers, nor separators like our modern threshing machines.

Agriculture generally centered around maize, wheat, oats, and potatoes as the principal crops. Buckwheat and turnips also were locally important. Fruit and vegetables generally were part of the farmstead. Maple sugar is referred to in the local literature as a crop of certain timbered sections. Locally broom corn was also raised. Swine, cattle, and sheep were imported by a goodly number of the first immigrants.

Practically the entire agricultural economy was of the subsistence type. Maize, or corn, grew well in the Calumet region. Since it could not stand the cost of transportation to market, it had to be consumed almost altogether locally. Wheat appears to have been the only commercially important crop of this period, and then only in the latter part. Early production does not seem to have been adequate even to meet local demands.[25]

URBAN SETTLEMENT PATTERNS

Difficulties of Urban Classification Nomenclature

By their very nature, pioneer settlements are more or less amorphous; the beginnings of urban-like settlements are necessarily embryonic and difficult to

[23] George H. Woodruff *et al., The History of Will County, Illinois* (Chicago, 1878), p. 553.

[24] *History of LaPorte County, Indiana* (Chas. C. Chapman & Co., 1880), p. 842.

[25] "In the winter of 1835 wheat on LaPorte Prairie was worth $1.50 a bushel and not half enough raised to supply the great demand occasioned by the influx of emigrants, so that most of the Lake County settlers had to draw their provisions from the Wabash during the summer of 1836." Solon Robinson, *Solon Robinson, Pioneer and Agriculturalist; Selected Writings*, ed. by H. A. Kellar, 2 vols. (Indiana Historical Bureau, 1936), p. 59.

classify as to hamlets, villages, or cities. The connotation, then, of urban communities as applied to this period, and as used in this paper, is any manifestation of a nuclear settlement of a few or greater number of houses with or without one or a combination of other community structures, such as a church, school, store, blacksmith or wagonmaker's shop, sawmill, gristmill, post office, etc. Such small settlements often combined both rural and urban functions.

Another problem of settlement classification and description arises from the fact that such urban data as are made available by local chroniclers follow no uniform pattern. One writer may give the size of a village by the number of blocks; another by the number of houses; still another by specific population figures. Dates of founding may be based on the coming of the first settler or a number of settlers. Or they may refer to the establishment of a mill site or some other community establishment, as a store. Or they may have reference to the time of survey or the filing of a plat or the "laying out of the town." Sometimes it is merely stated that "the town was started" at a given date.

Even location of exact site is at times difficult to determine from the vague descriptions, as in the case where the settlement has become extinct. Local chroniclers often were more interested in family history and other personal matters than in the geographic form or function of the community.[26]

Accounts of early towns, especially of the larger ones, were commented upon in diverse ways by various writers so that it is possible to get a good geographic perspective of the early development of such towns. Several of such examples will be given subsequently in describing a number of the more important communities.

In the Calumet, the first white settlement was an Indian trading post established by Joseph Bailly in 1822 (Fig. 1, Westchester; Fig. 2, t). By 1830 individual frontiersmen started to squat upon distantly isolated tracts of land held by the Pottawatomie. Following the federal survey and land sale (1834–39) the original squatters and newly arriving immigrants established individual farmstead claims to quarter-sections of land.

Factors Conducive to Nucleated Settlements

By the middle thirties some of the settlements began to take on nuclear or semi-urban forms. Ties of family kinship, or religion, or of some other common interest conduced to certain closely spaced, colonial settlements, as, for example, the Morgan families on the prairie named after them (Washington-Morgan townships). Originally the Indian trails and subsequently the pioneer wagon roads favored nucleated settlements, especially at intersections. Such were the sites at Valparaiso, Indiana, and at Worth, Illinois. Like isolated rural settlements, nucleated settlements often were identified with groves or the margins of other

[26] This statement does not imply that local biographical material is valueless to the geographer. Quite the contrary is often true. The very names of individuals or families often give information useful in determining not only the number of early settlers in the community but in inferring the section of the United States or of a foreign country whence the pioneer emigrated. Other demographic details often reveal occupational pursuits as well as the problems involved in adjustments to travel and living conditions in a frontier community.

timber tracts and adjoining the prairies. LaPorte, Door Village, Westville, Crown Point, St. John and Crete are of this type. Water features also had their attractions. Representative of river sites are the communities of Deep River, Hobart, Liverpool—all on Deep River. The river site was chosen in part for navigation but primarily for water-power development to operate sawmills and gristmills, discussed later in this report. Inland lake sites include LaPorte, Flintville, and West Point. On Lake Michigan there were attempts in this period to establish a number of port sites, only two of which have survived—Michigan City and South Chicago (formerly Calumet).

Hamlets, villages, towns, and cities, or by whatever name we want to call these invariably small nuclear settlements, are shown in Figure 1. It will be noted that, as in the case of rural settlement, urban settlement on the Illinois side progressed in this period more slowly than on the Indiana side of the Calumet. This is in marked contrast to the conurbanization of the west end of the Calumet today (see Indian Village—Pioneer Town, Fig. 2,e).

Most of the earliest villages established by the pioneers are on sites or near the sites of Pottawatomie encampments.[27] These include settlements at or near Michigan City, Door Village, Westville, Valparaiso, Merrillville, Thornton, Hegewisch, and South Chicago.

Although the pioneer settler and the Pottawatomie of the Calumet distinguished themselves for their mutual friendly relations, it is not to be presumed that whites occupied these sites because of any particular desire to be close neighbors to the Indians. It was rather the physical qualities of the site which influenced the whites in much the same way as they had influenced the Redskin. Moreover, most of the aboriginal sites represent trail terminals or trail junctions indispensable to circulation among the communities on the frontier otherwise suffering from extreme isolation. Such, for example, was Merrillville, where more than a dozen trails (local and regional) are said to have converged:

> Merrillville, population 100, at first called Centerville, was one of the early villages of Lake County. [It was] started as a center of settlement, and so called Centerville, by a few families who settled on and around the old Indian village locality known as McGwinns, among these the Zuvers, Pierce, Glazier, Saxton and Merril families, and J. Wiggins without a family, who soon became prominent in the growth of the village. From Wiggins, who made his claim where the Indian dancing floor and burial grounds were, which became the home of the family of Ebenezer Saxton, the woodland grove was called Wiggin's Point.[28]

Sites Cohesively Related to the Fundament

The Grove Village (Fig. 2,b). Natural features played a prominent role in the pioneer's selection of urban sites. The timbered fringes of the prairie and the forest groves attracted village settlements as they did rural settlements. Of this type, from east to west on the Valparaiso Moraine, are LaPorte, Door Village,

[27] Such location is to be expected in view of the fact that immigrants penetrated the region by the same routes that the Indian used and along which most of the chief encampments were established.

[28] Ball, *op. cit.*, p. 283.

Westville, Valparaiso, Merrillville, Crown Point, Crete, and Frankfort. A particularly pleasing effect in the landscape was noted where the openings in the forest looked upon the prairie on both sides, giving rise to "the door" expression in the toponyms of "Door Village" and its French equivalent "LaPorte." Door Village was founded in 1836 on a school section. In spite of its charming environs on Door Prairie, however, it could not successfully compete with the business and political advantages of LaPorte, the county seat, only three miles away.

The Stream-Mill Town (Fig. 2,k). Certain rivers in the Calumet, like the Grand Calumet and the Little Calumet and Deep River, are indicated as "navigable" on the original land survey plats. However, it does not appear from local records that pioneers found most of the Calumet streams and their tributaries useful for circulation. The reconstructed view of the original marshes and swamps along the meandering master Calumet drainage lines, as shown on the map, seems evidence enough why the otherwise marked navigable streams were of little service to transportation. Furthermore, the Calumet tributaries, except for the lower courses of Salt Creek, Deep River, and Thorn Creek, were not long enough nor large enough in volume to support navigation even for the small boats of the frontier. But when such streams had sufficient gradient, attractive sites were frequently exploited for water power development, so essential to frontier life.

Such were the communities of Springville, Waterford, Chesterton, Valparaiso, Hobart, and Deep River. These communities had either a gristmill or sawmill or both in one or separate establishments, also occasionally a carding mill, a cooper shop, or other type of workshop where such power could be used to advantage.[29] The mill type of community is typified by Hobart:

> When Mr. Earle saw that Liverpool was logically and really a back number, he gave his attention to the founding of another town [Hobart] two miles southeast on Deep River. In 1845 he had commenced to build a family residence at that location, began the improvement of the water power and laid the foundation of a saw-mill; in other words, was laying out a town in the rough. The saw-mill was put in operation in 1846, a grist-mill was soon added, and in 1847 the settlement looked so promising the Mr. Earle moved his family thither from the deserted village of Liverpool. His second town, Hobart, was platted in 1848.[30]

The Phantom Lake Port City (Fig. 2,y)

From the very beginning of Calumet settlement, pioneers recognized the strategic value of port sites at the head of Lake Michigan. This phenomenon is featured in formal city plats, four of which are reproduced in Figure 7. Four of these platted communities—Michigan City, City West, Indiana City, and Calumet —were on the immediate shore. Three—Bailly Town, Liverpool and Manchester —had sites on the Calumet river system, slightly inland. Most of these plat sites were destined to go down in history as nothing more than fantastic speculative

[29] A more extended account of such environs and activities is reserved for another section of this paper under "Industrial Geography."

[30] *Standard History of Lake County, Indiana, and the Calumet Region*, William Frederick Howat, ed. (Chicago, 1915), p. 170.

enterprises.[31] These dream or phantom port communities well symbolize the highly venturesome and speculative nature of real estate developments which have ever since characterized this region. This ambitious pioneer town platting was not limited to port sites at or near Lake Michigan. Various inland communities also were contemplated, on paper (e.g., in Clinton and Washington townships).

Some geographers may feel that we need concern ourselves only with towns which have survived down to the present or which, though dead, have left some relict landmark. It is here contended, however, that the forces interacting between man and his environment in such a commercially significant region as the Calumet cannot be fully understood without at least a casual acquaintance with these ephemeral but idea-perpetuating enterprises. A comparative study of "successful" and "unsuccessful" urban ventures as these may also furnish clues as to why some materialize and others fail.

Such studies may be said to present classic examples of "psycho-geography." What people think of environmental factors, or how they express themselves concerning them, is itself significant in the geographic interpretation of an area. So it is significant that, already in the first days of settlement, the cul-de-sac lake position of the Calumet, with its Indiana harbor potentialities, pre-occupied the minds of the speculative realtor, the business man, and the industrialist. The community adventures exemplify real estate promoters desperately competing for a site on or near Lake Michigan which would lend itself toward the development of the metropolis of the Great Lakes-Mississippi River region. Here is a case of regional and community planning in the rough.[32]

From east to west, the lake shore rivals were Michigan City, at the mouth of Trail Creek; City West, at the mouth of Fort Creek (modern Waverly beach of the Indiana Dunes State Park); Indiana City, at the eastern mouth of the Grand Calumet River (now closed by dune sand); and Calumet, at the western mouth of the same river (proximity of present-day South Chicago). Outside the Calumet region proper was the city of Chicago, founded as Fort Dearborn, at the mouth of Chicago River.

Four other platted communities—Liverpool, near the confluence of Deep River and the Little Calumet River; Manchester, near the confluence of Salt Creek with the Little Calumet; and Baileytown and Waverly on the latter river—had similar aspirations. These enterprises envisioned canals, something like the modern Burn's Ditch, to connect their paper plat sites with Lake Michigan.[33]

[31] Only Michigan City actually developed into a port city, the importance of which will be discussed below as part of the industrial and commercial development of the Calumet.

[32] It is interesting to note how a relict geographic influence of a cul-de-sac lake site, shared here by two states—Indiana and Illinois—can persist throughout all the four stages of occupance of a region. With the recent passage of an act by Congress authorizing the St. Lawrence Seaway project, agitation has risen anew in the area for a deep harbor development at the head of Lake Michigan adequate to accommodate ocean freighters and liners.

[33] "The plat at City West called for canals, and the plat of Manchester contains a street named 'Canal Street' and the plat of Athens, just south of Manchester contained a designate canal extending north and south along the west bank of Salt Creek." Bowers, *op. cit.*, p. 193.

What were these dream communities like? Why did some not get beyond the platting or planning stage, or beyond the hamlet or village stage of development? Why did Chicago, rather than Calumet (South Chicago) and Michigan City, achieve metropolitan status? How is the city pattern of modern Gary, the leading industrial steel center of the United States, related to the abortive plats of the earlier antecedent neighboring communities of Liverpool and Indiana City? The following descriptions of the several ghost cities by local chroniclers lend insight into the environment and events associated with the ghost cities, and help one to understand the complex interplay of physical and human forces which contributed to the decline of these projects.

City West. Community building intentions manifested themselves at City West as early as 1836.

> The "city" was laid out along the southerly shore of Lake Michigan, at, or just south of, the mouth of Fort Creek. The place is now known as Waverly Beach. [Pioneer toponymy study is in itself valuable as an aid in settlement study. Here the "amorphous" character of initial settlements is reflected by duplication of place names, though in the same state and even in the same region. Thus, the modern community of Wheeler, only a few miles to the southwest, also was called City West, and modern Waverly Beach is several miles distant from the site of extinct Waverly. For a toponymic geographic study of the Calumet see Alfred H. Meyer, "Toponymy in Sequent Occupance Geography, Calumet Region, Indiana-Illinois," *Proceedings of the Indiana Academy of Science,* LIV (1945), pp. 142–159.] Fort Creek, named for an old French fort, was only a small stream, but the promotors of the project envisaged a harbor at its mouth, for, it was said, surveys and soundings made at the time, disclosed superiority of this site over the site of its infant sister, Michigan City, a few miles away, for harbor facilities, at which place a small appropriation had theretofore recently been made for a harbor to be established at the mouth of Trail Creek, a stream scarcely larger than Fort Creek. . . . Plats or drawings, containing about ninety blocks and hundreds of lots, represented Fort Creek as a stream of considerable size [Fig. 7b]. A canal was represented on the plat bearing the name Michigan City and Kankakee Canal, which canal, according to plans, was to connect with the Little Calumet (Calimic) river at the mouth of Salt Creek. The principal promoters . . . had a great ambition to found a real city which they hoped would surpass Chicago, then a village, and become the metropolis of this region. . . . They were seeking an appropriation by the United States Government for the construction of a harbor at the mouth of Fort Creek, for the vision of these dreamers comprehended a city with a harbor—a mart at which vessels sailing the lake might anchor, and at which boats and barges might enter a connecting canal. These promotors, having had great faith in their project, had invested heavily in surrounding lands. The prospects seemed bright and hopes were high; settlers were coming; houses were being erected; but the building of harbors, even in that far day, required money—far more money than the promoters collectively could raise. Congress in its subsequent appropriations favored Michigan City to the exclusion of City West.[34]

But City West lost out in the race despite the effort made to win the support of Daniel Webster, who had accepted an invitation to stop here while making his stage coach trip to the West. It is said Henry Clay's influence also was used without avail. Other factors are cited for its decline. It was two or three years too late in starting. It lacked financial backing and, like other communities, suffered

[34] Bowers, *op. cit.*, pp. 182–184.

FIG. 7. Plats of Pioneer Calumet "dream" towns, such as these (a, b, c, d), illustrate some good geographic planning, but competition of a better geographic site and real estate promotion at Chicago (Fig. 8) proved too much for these paper communities which hardly advanced beyond the plat stage. (*Courtesy, Gary Library*).

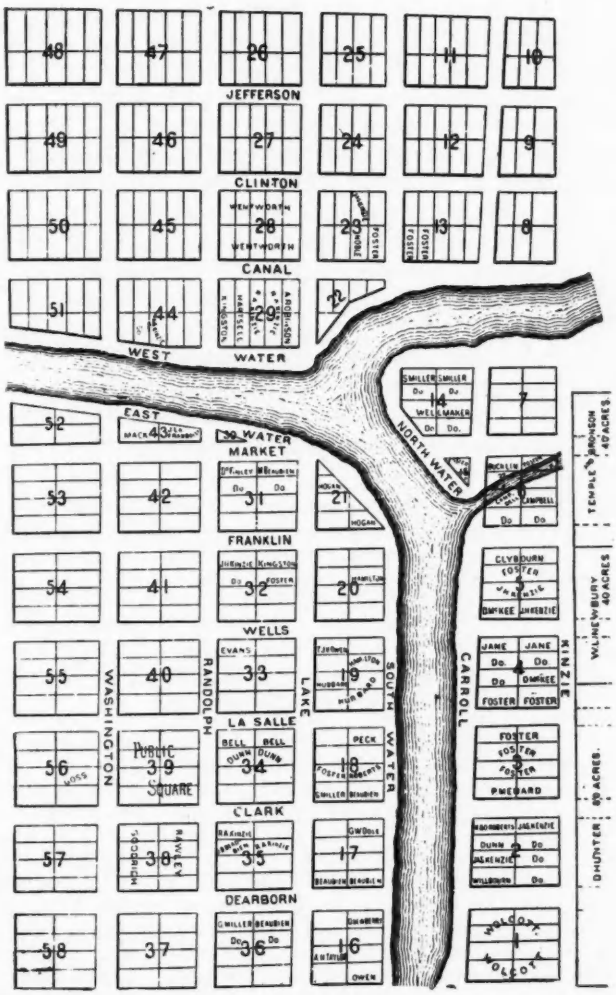


FIG. 8. Chicago plat, 1830, by James Thompson (*Courtesy, Chicago Historical Society*).

from the financial crash of 1837. A third factor was the shift of the main route of travel from the immediate beach along Lake Michigan farther inland. Finally, a fire destroyed all but a few of the houses, several of which were later moved away.

Indiana City. Indiana City, so named by an Ohio group, had its town lots laid out at the old mouth of the Grand Calumet. The plat, recorded January 4, 1838,

shows 78 lots, with streets and alleys 66 and 16 feet wide, respectively. A number of buildings were begun and a large sawmill was built. But the buildings were never completed except the sawmill, which was also abandoned ultimately.[35]

Though the site is reported to have been sold for $14,000, there is no evidence that lots were bought, the report apparently having been spread that the place had nothing to offer but marshes and sand dunes. This real estate failure, like so many of the others of the period, doubtless also reflected the general financial depression which affected the entire country, but as late as 1846 Congress was memorialized by the state legislature for an appropriation to develop this project. Although this paper city never materialized, it is interesting to note that its site is today within the limits of Gary.

Liverpool. Liverpool was laid out on Deep River only a short distance from its junction with the Little Calumet. "The Calumet and Deep Rivers were to be to this commercial emporium of the future what the Seine is to Paris or the Thames to London."[36] The following excerpts not only show how Liverpool arose, but also illustrate how the Calumet geography of that day impressed the adventurous real estate promoter:

> The site having been located on the branch of the Chicago-Detroit road which extended westerly by way of Blue Island, numerous travelers and considerable traffic passed through the new town. In 1837 a stage route was established between Michigan City and Joliet which passed through Liverpool. Stores were erected. Hotels were built. . . .
>
> Away back in the distant past, when what is now Lake County, was a township by the name of Ross, in Porter county; long before the advent of railroads in the central west, and when the total railroad mileage of the United States scarcely exceeded a hundred miles; when Chicago was yet a struggling village in the swamps; when the Indian trail was the only road, and the ox-cart and the stage-coach were the only means for the overland transportation of passengers in this new domain; when the supper-table was lighted with a lamp made from an iron spoon, containing a strip of cloth for a wick and melted lard for oil; when the surrounding country was composed of primeval forests and trackless marshes covered with wild rice and other tall grasses; when there were yet but a few white settlers within the territory comprising the county of Lake; before bridges were built across the streams, and when rivers were crossed by ferries, one John Chapman, and two associates by the names of Frederickson and Davis, conceived the idea that this location at the junction of the Deep and the Little Calumet rivers, then about the head of navigation for boats, would be a good site for a great city that might overtake the little village in the marshes surrounding Fort Dearborn. The government engineers had just recently completed the survey of lands in this locality into townships, six miles square, and sections within the same a mile square; but the government had not yet exposed the lands for sale, and therefore the settlers could not yet purchase lands directly from the United States. A few white settlers had arrived and located upon lands as "Squatters," who afterwards designated their claims in a book which they prepared and called "Claim Register." But they were simply "squatters." The lands had theretofore belonged to the Indians of the Pottawotamie Nation, in common, but by the treaty of 1832 these lands had been ceded to the United States, and under the treaty, certificates commonly called "floats," were issued to certain of the Indians individually, entitling them to select and enter upon designated quantities of land allotted to them, such as sections or quarter-sections, thus to

[35] Goodspeed, *op. cit.*, p. 541.
[36] Goodspeed, *op. cit.*, p. 523.

obtain title to specific parcels in severalty. Chapman was eager for the great adventure —the founding of a city on the frontier. He did not want to wait for the government sale, the date of which was then neither announced nor known. He evidently wanted to start while the starting was good. He obtained a "float" from an Indian named Quashma, a beneficiary under the second treaty of Tippecanoe for section 24, Township 36 North, in Range 8 West, and proceeded to plat about 160 acres of the land, without waiting for a patent from the United States for the land. This was in January, 1836. Lands in Lake County south of the Indian Boundary line were not open to sale until March 19, 1839.

These promoters were doubtless not only ambitious to be the founders of a city bearing a name already famous, but, like most real estate promoters, had in mind the magic of a name, they called their plat "Liverpool." Of the streets thereon they had their Broadway, their Market Street, their Chestnut Street, Michigan, Indiana, and others of like dignity and rank, some of which were 100 feet in width. One block was designated "Public Square;" another "Market Square;" another "Church Square." Then there were 40 blocks subdivided into lots, 435 in number [see Fig 7c]. Through this city to be, flowed the waters of Deep River, then described upon the plat as being 14 feet in depth, there being 18 blocks north of the river and 23 south.[37]

No definite record seems available as to the degree to which the city attained its metropolitan aspirations. Estimates are between ten houses and fifty inhabitants and a hundred houses and five hundred inhabitants. Liverpool also aspired to be the county seat of Lake County. But two other communities—the Robinson settlement at what is now Crown Point, then called Lake Court House, and the settlement at Cedar Lake, then known as West Point—also competed for the honor. The county commissioners decided in favor of Liverpool. But citizens from the western and central parts of the county were dissatisfied with the location, and a new commission ruled in favor of Lake Court House. To this adverse experience and the panic of 1837 local writers have attributed the decline of the community.

It seems not to have occurred to anyone to point out the environmental limitations of the Liverpool site due to the extensive and impassable marsh then existing at the confluence of the two rivers, as is shown on the map, Figure 1.

Town of Bailly. The surviving Bailly homestead may be considered a memorial to the adventurous spirit of the pioneer Calumet realtor as well as of the antecedent French fur trader. Two of the relict structures of this historic mission and trading post are shown in Figure 9. This landmark represents the oldest settlement in the Calumet region, and can best be described in its historicogeographic setting:

Joseph Bailly, a Frenchman engaged in the fur-trade in the region of the great lakes, was the first white man to settle in the Calumet district. He came in 1822. For ten years he was the only white settler in this land of the Indians. He was diligent in business, and acquired many sections of land. He too had at least a modest ambition to found a town that should bear his name. He prepared a plat bearing date December 14, 1833, entitled "Town of Bailly" [see Fig. 7a]. The site was located on the north bank of the Calumet, in the southeast corner of section 28, T. 37 N., R. 6 W. He laid it out "four square," with blocks, lots, streets and alleys. He honored his family in the naming of the streets. One he called LeFevre, after the name of his French-Indian wife, at the

[37] Bowers, *op. cit.*, pp. 87; 177–178. A similar promotional venture borrowing a famous name was that of Manchester (Fig. 7d).

time of their marriage; others were named respectively Rose, Ellen, Esther and Hortensia, after the names of his daughters. One he named Jackson (doubtless for the President of the United States), and one Napoleon (in honor of the French hero.) Streets running at right angles to the foregoing bore the names of the great lakes: Michigan, Superior, Huron, Ontario, Erie and St. Clair. He had a form of warranty deed printed especially for use in the sale of lots in this subdivision, with notarial certificate attached, leaving only blank spaces for the name of grantee and a description of the lots sold in the "Town of Bailly." There were prospects of a railroad and a canal. He negotiated a contract of agency with one Daniel G. Garnsey for the sale of lots. A few lots were sold. But in 1835 death called the first pioneer of the Calumet region, and the deeds,

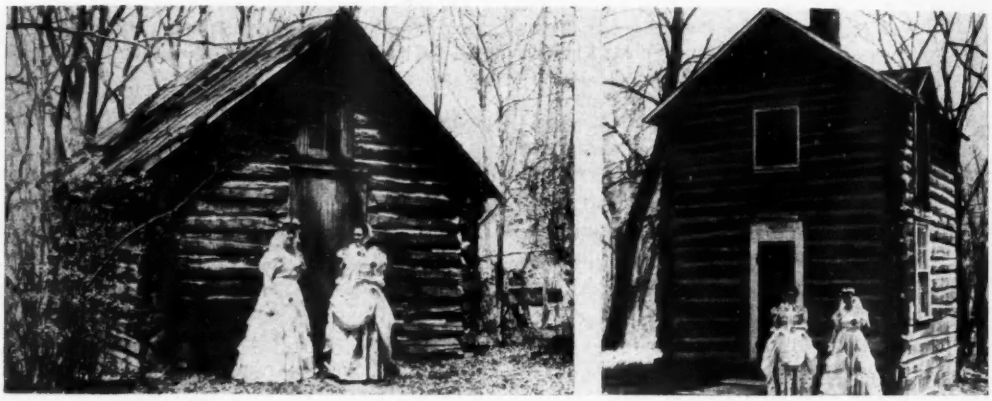


FIG. 9. A relict landmark which has survived all four stages of occupance of the Calumet is the Bailly homestead (1822). Two buildings of this historic heritage are shown here. (*Courtesy, Saidla Studio.*)

plat and the books of account which he had carefully and neatly prepared in his native tongue, for forty years, were all laid aside. No more lots were sold. But a Bailytown still remains as the name of a settlement on the land once owned by Mr. Bailly, on the old Detroit–Chicago trail. And thus ended, tragically, hopes doubtless once fondly cherished.[38]

Waverly. Only one and one-half miles east of Baileytown on the Calumet River another tract of land named Waverly was platted into lots (not to be confused with the modern Waverly Beach in the Indiana Dunes State Park). A few related families built a cluster of six log cabins on this site. Like Baileytown, Waverly at its inception was a sort of Indian trading post.

As the original Baileytown was hardly more than a location, Waverly is considered the first town in the township [Westchester] and also in the county [Porter]. It has been found out that as much as ten thousand dollars was expended for improvements.[39]

Waverly seemingly could not compete with the nearby business and trading center of City West (site of modern Waverly Beach) with its superior location on

[38] Bowers, *op. cit.*, pp. 195–196.

[39] Thelma Johnston, "Business Affairs of Westchester Township, Porter County." MS, Porter County Historical Society.

lake and land traffic routes. Finally, in 1838, the town was destroyed by a forest fire and was never rebuilt.

Other Hamlets. Several other smaller communities with lofty but frustrated ambitions were Flintville (Porter County) and West Point (Lake County). Flintville once had factories and shops. At West Point the "lake settlers took quite an interest in fishing, the store and tavern proved to be quite attractive, while several of the men gave their attention to mill-building."[40] Both towns had plans to become county seats: the former of Porter County, the latter of Lake County. But neither plan materialized. One writer believes that West Point was not able "to hold its population with the wealth of prairie land beckoning from the southern part of the county [Lake]."[41] Whether this is true or not, the settlers did move southward. Resort cottages now occupy part of the early sites of these communities.

Consideration of these phantom or dream communities thus affords an instructive commentary on the complex interrelationship of geographic and historic factors which have conspired to make the Calumet community enterprises some of the most speculative in the country.

The County Seat Town (Fig. 2g)

A microgeographic study of the town which became the county seat lends itself to an interpretation of not only the physical and economic factors of the frontier community, but to an understanding of certain psychic and political factors as well. Once the land has been surveyed and opened to settlement, local government becomes necessary, and so the frontier country is organized into counties, the congressional townships are transformed into civil townships, and the larger settlements become incorporated towns. It logically follows that county seat towns because of their administrative function would be the first to be so organized. A few examples will illustrate how particularly the factors of location and transportation were related to frontier politics of this period—typical of most other sections developed out of the Northwest Territory.

Crown Point. It seems that every pioneer settlement regardless of its geographic position had aspirations to become the seat of county government. Liverpool and West Point in Lake County, for example, vied with Crown Point for such distinction. But Crown Point was finally selected as the county seat of Lake County because of its more central position. And, as if to emphasize this point, the township in which it is located was named Center Township. As early as 1837 several buildings were erected at Crown Point, then called Lake Court House. Ten years later, Solon Robinson, an original resident of the place, reported that it contained "about 30 families . . . 2 churches building . . . 2 stores . . . 1 tavern, 2 convenient public offices . . . 1 school house . . . and the usual quota of mechanics,

[40] Howat, *op. cit.*, p. 149.

[41] Benjamin Cohen, "Lake County before the Railroad Era," *Indiana Magazine of History*, June, 1936, p. 126. M.A. thesis, Department of History, Indiana University, Bloomington, Indiana.

as carpenters, masons, wagon-makers, blacksmiths, tailors, shoemakers, 4 doctors and 3 preachers."[42]

Valparaiso. The story of county seat competition is repeated in neighboring Porter County, bounding Lake County on the east. Here the rivals were Flintville and Valparaiso. Although the former is only about three miles farther north, the latter is by that distance more centrally situated—one of the factors again favoring Valparaiso. Moreover, it is much more centrally situated with respect to its township, significantly also called Center Township. Although nothing has been found in the local literature to indicate that its location on the famous Old Sauk Trail and its function otherwise as one of the leading trail junctions in the Calumet were deciding or contributing geographic factors to its selection as county seat, circumstantial evidence strongly points to this conclusion.

Valparaiso was first known as Portersville, both it and the county having been named in honor of Commodore David Porter who commanded the Essex during a battle near Valparaiso, Chile, in the War of 1812–14. Incidentally, the Essex was also honored in one of the county's early township names. The town was platted in 1836 by the local secretary of the Porterville Land Company.

> It consisted of forty-two blocks, with the intervening streets and intersecting alleys, bounded on the south by Water street, on the east by Morgan street, on the west by Outlets, 15 to 20, inclusive, while the northern limits consist of Blocks 1 to 5, inclusive, being a strip of four rods in width lying north of Erie street.[43]

The community at this time had about one hundred inhabitants. The following year, the name was changed to Valparaiso after the Chilean port of Valparaiso, near which Commodore Porter fought the famous sea battle referred to above. Etymologically, the name is a decided misnomer, for Valparaiso is situated near the elevated crest of the Valparaiso Moraine and topographically is just the reverse of what is suggested by the vale location of the "Valley of Paradise," in Chile.

LaPorte. Still a third race for county seat honors is recorded in LaPorte County, eastern neighbor of Porter County. Here Michigan City and Door Village vied with LaPorte for political distinction. Again arguments for centrality of geographic position of LaPorte won out; and also, as in the other two counties, "Center" was the name given to the centrally situated township in which LaPorte is located.

The beauty and utility of the spot appear to have been additional psychogeographic factors in selecting the site. It was surveyed and platted in 1833.

> For beauty of situation LaPorte is unsurpassed. East, south and west lie spread out, the rich prairie lands, interspersed with groves; and on the north, coming up to the edge of the city is a chain of small lakes, gem-like in their beauty, the most noted of them being Clear lake, Stone lake and Pine lake. It is not strange that those who first came, should have beheld in this spot the place for a town which should be the county seat of the county. It may readily be imagined that when nature only had visited the lakes and groves and prairies of this locality, the dullest and most unsusceptible of minds must have been touched with its beauty.

[42] *Op. cit.*, p. 79.
[43] Goodspeed, *op. cit.*, p. 113.

> LaPorte is situated on what was known as the "Michigan Road Lands." They were sold at the land sales at Logansport in the month of October, 1831; . . . The town was laid out and the original survey made in 1833. There were already a number of settlers in the place. . . . In 1834 there were fifteen houses on the ground which was to be occupied by the future town.[44]

PIONEER INDUSTRIAL GEOGRAPHY

The first industries of pioneer Calumet were naturally those which supplied the immediate necessities of frontier life. Such life had to be almost altogether self-sufficient. Building materials for cabins, for bridges to span the rivers, planks for the otherwise impassable sections of the mud roads, and dimension lumber from which to make the first wagons and agricultural implements necessitated the establishment of sawmills. Next in order of time and importance were the so-called gristmills or flour mills to grind the local farmers' grain. Carding mills processed the home-grown wool. Then there were shops of various kinds characteristically associated with each community—wagonmaker shop, blacksmith shop, harness and saddlery shop, shoemaking shop, cooper shop, cabinet shop, and tailor shop. Late in the period in one or another of the towns there appeared a variety of establishments—cheese factory, tanning factory, spinning and weaving factory, broom factory, hat factory, foundry for manufacturing iron castings, threshing machine factory, distillery, brick kiln, and meat packing houses.

The pattern of geographic distribution of these various mills, shops, factories, and other establishments was quite different then from now. Unlike today when we find such industries associated with urban communities, these establishments, particularly the mills and shops, were first scattered throughout the countryside, as part of a simple rural home economy. Several local references will serve to illustrate this point:

> Jesse McCord established the first blacksmith shop a mile and a half southwest of Clear Lake.[45]
>
> Mathew Mayes had a blacksmith shop at Mayes' Corners, near which Shubal Smith had a wagon shop. Also during the year a man whose name was Purcell, put up a wooden-bowl turning lathe on Mud Creek. This was afterward turned into a split-bottom chair and spinning wheel factory.[46]
>
> William was a cabinet-maker by trade, and built a shop on the road just below the house where one of the Barnard boys now lives. He made all the furniture for years, such as bureaus, bedstead, and tables as everything had to be made by hand.[47]

A farm itself may be the site for a shop: "In 1835 Adam S. Campbell opened a shoe and boot shop on his farm."[48]

[44] Jasper Packard, *History of LaPorte County, Indiana* (S. E. Taylor and Co., 1876), p. 102.

[45] Lila E. Whitlock, "Early History of Jackson Township, Porter County, Indiana, 1916," MS, Porter County Historical Society (no paging).

[46] *History of LaPorte County, Indiana* (Chas. C. Chapman and Co., 1880), p. 595.

[47] Whitlock, *op. cit.*

[48] "Washington Township, Porter County," MS (no author nor date) Porter County Historical Society.

Since all the mills in the early part of the period and a preponderance of them in the latter part of the period depended upon water power, they were naturally located along streams (see Fig. 1).

The crossroads might be expected to furnish the favored spot for a shop or a factory, before towns in the latter part of the period begin to take over this function. "William Reed . . . settled in an early day, one half mile north of the Quaker corner in section 24. . . . He built a [blacksmith] shop at the corners to be more centrally located."[49]

Sawmilling

In pioneer days the sawmill seems to have been the first factor of economic importance next to the establishment of the farmstead itself. Thus, one commentator on Lake County observed that—

> The increase of immigration and building which had been especially noticeable since the organization of Lake County in 1837 made sawmills and bridges most important adjuncts to the proper development of the country. Four of the earliest mills are accredited to the year 1838, called from the names of their builders, Walton's, Wood's, Dintin's and Taylor's.[50]

At least one mill was reported already at the time of the original sectional survey (1834). It is indicated by the surveyor's notation for Sec. 1, T 36N, R 5W (southeast corner of Pine township), which reads, "On southwest quarter of section a sawmill in operation and on northwest quarter a good mill site."[51] The first houses were built of logs, hewn or unhewn (Figs. 4a and 9). Although interested in more modern homes constructed from lumber, the pioneer endeavored first of all to improve transportation facilities by building plank roads and bridges, since pole bridges and roads were notoriously treacherous. Moreover, lumber was badly needed for wagons, plows, and other agricultural implements.

It might well be said, therefore, that sawmilling was a real institution at this time, as revealed by scores of references to sawmills by the local historians of the several counties. Unfortunately, reference to location of millsites by local chroniclers is either ignored altogether or is presented for the most part in such vague terminology that one can construct only a generalized geographic pattern of the sawmills in the region, as has been attempted on the Figure 1 map. The local chronicler, for example, was often satisfied with merely indicating that the mill was "in the southwest part of the township," "near the present town of Otis," or located "on Coffee Creek." In other instances locations are well localized but associated with names of property or mill operators now difficult to identify. Few relicts of these early mills are in existence today.

The map (Fig. 1) does not presume to give a complete picture of the sawmills

[49] Lila E. Whitlock, "The Quaker Settlement," MS (no paging.)

[50] Howat, *op. cit.*, p. 55.

[51] Sawmilling is reported by Higgins even earlier than this. He states that the first mill was built and the first lumber sawed in Porter County in the fall of 1832. Higgins, *Illustrated Historical Atlas of LaPorte County, Indiana, 1874* (Chicago, 1874), p. 3.

in the region for the period, nor does it indicate in every case the exact site of each mill that is shown. By consulting a great number of sources and recording those sites whose location was precisely given, and by piecing together general but varied references to location from several sources, it is possible, nevertheless, to show what the general pattern of sawmill distribution was like. Moreover, by superimposing these data on the background of the fundament, we can see how this mill pattern is related to the original natural forest which was exploited for lumber products and to the original streams upon which the mills depended for power.

The greatest concentration of mills, it will be noted, is on the Indiana side of the Calumet. This phenomenon is readily correlated with the fact that the predominant vegetation on the Indiana side is forest, whereas the Illinois landscape is predominantly prairie. Moreover, the Illinois timber was almost exclusively deciduous, whereas the forests in Indiana near the lake shore included appreciable stands of pine and other conifers, also indicated on the map.

In addition, the Indiana streams are more favorable to water power development. Whereas in the Illinois area there is only one major stream—Thorn Creek—tributary to the Calumet river adapted for millsites, the Indiana side has five major streams of sufficient flow and gradient to provide excellent millsites—Thorn Creek, Little Calumet River headwaters, Coffee Creek, Salt Creek, and Deep River.

Finally, it is to be noted that the greater part of the immigrants into the region came from the East and established settlements progressively in LaPorte, Porter, Lake, Cook, and Will counties. This also, then, must be considered a contributing factor to the establishment of a larger number of mills in the eastern end of the region.

The mill seat pattern bears an interesting relation to the general drainage pattern of the region. Normally we expect to find the larger amount of water power developed along the master streams. But this is not the case in the Calumet. Owing to poor transportation there was a pressing need for many small mills well distributed rather than larger ones in a few places. Moreover, neither the stream bed of the Grand Calumet nor the Little Calumet below its headwaters had any perceptible gradient. The former at that time had two mouths connected with Lake Michigan, and the current might move either to the east or to the west end of the stream, depending upon which way the wind blew. Reference to a relief map will reveal the singular fact that not a single contour crosses the Grand Calumet throughout its course.[52] Furthermore, the extremely shallow banks of both streams, flanked by extensive marshes or swamps throughout a large part of their courses, made dam construction difficult.

Under this anomalous drainage condition the only tributary of the Grand Calumet is the Little Calumet, and the flow of this stream below its headwaters

[52] See Figure 4, Meyer, *op. cit.*, p. 253.

is about as imperceptible as that of the Grand Calumet. The tributaries of the Little Calumet, on the other hand, like the tributaries of Trail Creek in the northeast, rise near the crest of the Valparaiso Moraine and have an appreciable descent on the north slope of the moraine.

Although stream conditions favored water power development, dam construction for millsites on these streams seems to have offered seasonal problems. It is to be noted that no rock outcrops occur anywhere on the Indiana side, and in extremely few spots on the Illinois side.[53] Natural rock formations, therefore, were lacking to provide either a natural rock dam for a water fall or a rock bank into which to anchor a dam. It is not surprising, then, to read of the frequent destruction, permanent abandonment, or relocation of the mills. For example,

> Dustin's, Miller's, and Walton's have been in utter ruins for years, on account of the difficulty of making a dam of dirt stand, and Taylor's is about half the time without water, and the other half without a dam.[54]

This ephemeral characteristic of millsites is worthy of note since it points not only to one of the major problems of the pioneer, but also to the difficulty of making a complete contemporaneous mill map.

The greatest concentration of sawmills is found along the headwater tributaries of the Little Calumet River, especially along Coffee Creek. Although the amount of water available in these small streams must often have been inadequate, there were other geographic factors which definitely favored mill seats in this area. The north side of the moraine here has considerable slope and so imparts a gradient to the streams well adapted for dam construction. The area is located in the largest contiguous forest section of the Calumet region, and one of the very best, since it includes not only some of the finest hardwood timber but some conifer as well. Furthermore, it was nearest to the earliest and best settled area at the time—the Door Prairie-Westville region to the southeast.

Trail Creek and its tributaries probably had the next larger number of sawmills. Because of the extensive "barrens" noted in the vicinity, deciduous stocking does not appear to have been as good as that of the previous mentioned area, but pine trees were more plentiful. The particular advantage for lumbering here was the early establishment of the lake port of Michigan City at the mouth of Trail Creek, a sizable stream. The lumber of the Trail Creek area was in great demand for building up not only this community but that of Chicago as well. Several other sawmill communities closer by but otherwise less favorably situated also shared in Chicago lumber patronage of which Hobart in east Lake County appears to have been one of the leaders.

> Hobart was at one time the head of the timber trade to Chicago from this region [Lake County and vicinity]. In fact, the Old Lake Street plank road in Chicago was built from lumber from Hobart and vicinity, and the first cedar block road in Chicago was built from blocks sawed in the Hobart mill.[55]

[53] See Figure 2, Meyer, *op. cit.*, p. 249.

[54] Bowers, *op. cit.*, p. 48.

[55] Alice Mundell Demmon *et al.*, *History of Lake County*, Vol. XI, Old Settler and Historical Association of Lake County, 1934, p. 54.

Little is recorded in early local literature on the detailed nature of timber stocking available for lumber. From repeated references to oak, hickory, walnut, and pine, we infer that these head the list of merchantable saw logs. For the Calumet marsh and sandy plain area stocking (particularly of Lake County), Ball mentions white pine, red cedar, and several varieties of oak; for the morainic upland, oak of several species, hickory, slippery elm, ash, and "stragglers" of red cedar, black walnut, and hard or rock maple.[56] Woodruff in his work on Will County makes the following observations on timber and lumbering:

> Oak, black walnut, hard and soft maple, buttonwood and ironwood, of these and others there was a large and vigorous growth of fine trees on the first settlement of the county, most of which in a few years fell before the ax of the settler for the purpose of building log houses, rail fences, firewood, etc., and as soon as sawmills were built, for lumber.[57]

A classified forest map of the period would be helpful in understanding just what the stocking of the forest was like as to species and to relative number and size of trees. We would not expect, of course, to find such a map accessible, or sufficient data available to construct such a map. However, a certain amount of inventory tree data is found in the field notes of the original land survey based on instructions from the Surveyor General's office to the deputy surveyor that he is to "rate the kinds and quality of timber and undergrowth, naming the different sorts in the order in which they predominate. . . . The names of all bearing or witness trees, and station or line trees, must be written out in full. . . ." The type of tree inventory along a certain section line is exemplified by the following notations in a field book:

> 27.60 (chains), a white oak, 15 inches diameter; 33.70, a hickory, 24 inches diameter; 40.00, set a quarter section corner post on the top of a ridge . . . from which post, a white oak, 21 inches diameter bears S 28°W. 197 links, and a poplar, 18 inches bears N. 56°W., 14 links distant. The S. 27.60 chains . . . subject to occasional inundation . . .; timber walnut, cherry and white oak; undergrowth, pawpaw and spice.[58]

Although such data do not enable the geographer to construct a classified vegetation map of contiguous areas, inventory and descriptions of this type do enable him to reduce these to a transect map base and thus convey a much better areal perspective of the timber stocking than can possibly be given by any amount of verbalization. A section-by-section transect map is presented in generalized form (Fig. 5) to show a representative timber and lumbering area of this period.

Gristmilling

Flour was recognized as the second major need in the pioneer community, and so the flour mill, called by the pioneer the gristmill, immediately followed the establishment of the sawmill. Cincinnati and St. Louis were then the nearest markets where flour could be secured, and since commerce was slow and uncertain,

[56] Ball, *op. cit.*, pp. 450–451.

[57] Woodruff, *op. cit.*, p. 227.

[58] General Surveying Instructions to Deputy Surveyors in Illinois and Missouri, January 9, 1834.

and freight rates high, flour was often scarce and wheat bread a luxury.[59] Even when produced locally, the cost of flour was excessive. "Wheat was selling for twenty-five up to fifty cents a bushel, but it was ground in the crudest way, often as the Indians did it, between two stones, and flour cost $10.00 per barrel."[60]

In a few instances the gristmill may have been built simultaneously with the first sawmill in a community, but the former usually followed the latter by several years. The following is a typical example:

> In 1835 or 1836 Samuel Shigley built a saw-mill on Salt Creek south of Valparaiso one mile. Here William Cheney in 1841 built a grist-mill. This is said to be one of the best water powers in [Porter] county. This became in after years William Sager's flouring mill.[61]

Gristmills and sawmills were often combined in the same establishment; hence the identification of certain mills in plural form, like the Scott's mills at early Woodvale, now Deep River. In some instances gristmills and sawmills are simply referred to in the literature as mills without distinguishing one type from the other, thus making it impossible always to distinguish them on the map.

The gristmill, unlike our modern flour mill, was an extremely simple affair. Its power equipment was practically identical with that of the sawmill. Its grinding mechanism consisted of from one to four runs of stone buhrs. Runs from one to two buhrs were sufficient for the custom trade of the average neighborhood community. Because of the travel distance and poor transportation, a pioneer might take enough wheat to the mill to get a year's supply of flour and feed on an exchange basis of perhaps forty pounds of flour, twelve pounds of bran, and eight pounds of shorts for each bushel.[62]

An extra pair or two of buhrs appears to have been added by the so-called merchant mills to satisfy the trading demands of the more closely settled communities or of a larger trading area. Among the most noteworthy of the latter type was the Scott mill on Trail Creek in Michigan Township, whose trade extended over a wide expanse of territory, traders and merchants coming from Chicago, Rockford, Galena, Joliet, and other towns in Illinois.[63]

Another millsite of this character was the Wood's mills referred to above (Fig. 4b). The establishment started out as a sawmill (1837); then added a gristmill (1838). These mills for many years rendered a large custom service. They finally became a large merchant flour mill. A further account of the Wood's mill seat seems desirable here not so much for its historic and economic prominence but for the geographic insight it provides on travel conditions of the day, on the qualities of a millsite, and the problem of establishing a valid land claim typical of the early pioneer settlement of this period:

[59] Judson Fiske Lee, "Transportation as a Factor in the Development of Northern Illinois Previous to 1860," *The Journal of the Illinois State Historical Society*, Vol. X, No. 1 (April, 1917), pp. 17–85. A Ph.D. dissertation in the History Department, University of Chicago.

[60] Oglesbee, *op. cit.*, p. 138.

[61] Ball, *op. cit.*, pp. 514–515.

[62] Bowers, *op. cit.*, p. 81.

[63] Chapman, *op. cit.*, pp. 745–746.

> To this wild, unsettled section came John Wood in 1835, alone. It was still the home of the Red Man and the fur trader. . . . Mr. Wood pressed onward in search of a millsite and found the ideal spot at this place. The stream was wide and deep and later became known as Deep River, which has its source near Crown Point and its mouth near Liverpool, being navigable in those early days as far as this spot. After building a log cabin on the east side of the river in the fall of 1835, he went to Laporte to enter his claim, which was in December of that year. The price was $200. He then went back East to get his family, consisting of his wife and five children. As near as is known, the family went as far as possible by rail, then by the Erie Canal to Detroit and then by wagon on the old Detroit–Chicago road to Michigan City, leaving there on July 4, 1836, for the new mill-site. It appears that during the absence of Mr. Wood, Gen. Tipton of Fort Wayne, a U. S. Senator had laid a float upon this particular claim in the name of an Indian, Quash-ma. The land as a mill-seat was not properly subject to an Indian float, but Mr. Wood desired this particular tract of land and instead of paying $200 he paid $1000 and secured the Indian's deed and signature. Mr. Wood erected a saw mill in 1837.[64]

Because both the identity and location of flour mills, like those of sawmills, are at times indefinite, their mapped occurrence, as in Figure 1, has validity primarily in depicting representative site locations and in deducing therefrom broad regional correlations.

The geographic site conditions for gristmills were essentially the same as for sawmills—both being dependent in the early days upon water power. One might expect to find the gristmills characteristically identified with non-timbered sections, as on the extensive Door Prairie, Forgan Prairie, and Robinson Prairie in Indiana, and the even more extensive prairies on the Illinois side. But such a mill location is rare indeed. This is obviously the result of a combination of geographic factors. Coincidentally, streams especially adapted for power are singularly few on the Calumet prairies. Furthermore, as has already been indicated, one must not overlook the fact that the first settlers actually did settle in the forest or on the edge of the forest and cleared the timber for cropland rather than use the prairies for this purpose. The greater concentration of gristmills in the east, particularly in the northeast Trail Creek area, seems definitely related to priority of settlement and the fact that Michigan City was an exporting point for mill products.

Other Pioneer Establishments

Separate from, or in conjunction with, other forms of milling was the carding of wool. "Mills for carding wool were put in operation not far south of Valparaiso, perhaps as early as 1836, one of these on Salt Creek."[65] Still others made sorghum molasses and cider.

Lack of good transportation facilities caused every pioneer settlement to make itself as self-sufficient as possible. In addition to constructing mills, which provided shelter, food, and clothing products, settlers had to establish various shops or factories for the production of vehicles for transportation, implements for the farm, furniture for the home, and miscellaneous products most urgently needed in frontier life. Blacksmithing and wagon-making were leading trades in almost

[64] Bowers, *op. cit.*, pp. 124–125.
[65] Ball, *op. cit.*, p. 515.

every community. Unlike the mills, which were restricted to river sites for power, the blacksmith and wagon-maker shops might be found on almost any farm or at some crossroads in the community, as illustrated by the following examples:

> William Reed . . . settled in an early day, one half mile of the Quakers corners in section 24 . . . built a shop on his land and worked there for some time; then he built a shop at the corners to be more centrally located.[66]
>
> The work of a blacksmith was a necessity, the location of a shop essential to every neighborhood, and though there were many in the country, farmers would often times have to take their plows twenty-five or thirty miles to have them sharpened and pointed. Because of the absolute necessity of a blacksmith, his first coming into a new settlement was noted in its annals as an important addition and as an agency which would make the settlement more prosperous.[67]

Since all vehicular travel was by wagon, or in a few cases by carriage, the wagon-making shop had an equally prominent place in the life of the pioneer community with the blacksmith shop, was located on similar sites and often identified directly with it. Other significant woodworking establishments included cabinet shops and cooper shops. These, too, might be found on any roadside. Each neighborhood had its own cooper-shop, which made tubs, buckets, and barrels.

The current chronicles of the time mention other pioneer industries: a spinning wheel factory; breweries and distilleries; establishments for the production of cheese, cider, sorghum molasses, and maple sugar; shops for tanning, harness and saddle making, boot and shoe making, and hat manufacturing. All the processed goods depended on local sources for their raw materials. This is characteristically illustrated in the case of a hat manufacturer of LaPorte who "advertized that he desired 'to purchase all the Coon skins that may be taken of such varmints in Northern Indiana; also Beaver, Otter, Muskrat, Mink, and Rabbit Skins, and Lamb's Wool.' "[68]

The more advanced urban communties, such as LaPorte and Michigan City, during the latter part of this period began to experiment with some of the heavy industries. Michigan City, in the early forties, had a beef and pork packing establishment, and LaPorte had a foundry which made iron castings and threshing machines.

Although iron ore was already being imported at this early date into the Calumet region at the lake port of Michigan City, deposits of low grade iron ore in the form of "bog ore" in LaPorte County attracted local attention, as was characteristic of other pioneer communities. A blast furnace was erected in 1848 but lasted only a few years "since the railroads soon made better ore more cheaply accessible."[69]

[66] Whitlock, "The Quaker Settlement," MS (no paging).

[67] Lee, *op. cit.*, p. 59.

[68] "Inventory of the County Archives of Indiana," *The Historical Records Survey Works Progress Administration, No. 46, LaPorte, 1939,*

[69] *Ibid.*, p. 18.

PIONEER COMMERCIAL GEOGRAPHY

In the preceding Pottawatomie period commercial activities were limited to a few trading posts where the French and American fur trader exchanged white man's goods for the pelts brought by the Indiana trapper. It is to be expected, then, that such barter would continue through the early part of the pioneer period. The Pottawatomie tribe as such relinquished its claim to the Calumet and adjacent territory by treaty in 1832, and the Pottawatomies, 5,000 strong, set out from Chicago for their new reservation in the West in 1833–35. But quite a number of small isolated groups for one reason or another still camped about in the Calumet until about 1840, and some Indians remained throughout this period. During this transition period of occupance much neighborhood barter was carried on between the Indians and the new incoming settlers.

Trading with the Indian

Trading between the white man and the Indian often consisted of a mere exchange of goods between neighbors: The Indians "came to the house begging for things to eat. They traded venison for pork and salt meat, and we gave them iron kettles, potatoes and meal. Sometimes we would get leggings and other things trimmed in beads."[70]

At a number of places in the Calumet systematic commercial trading was carried on at regularly established trading posts or stores, and peltries instead of money constituted the medium of exchange. Such, for example, was the Joseph Hess trading post at Hessville where the Indians exchanged furs for tobacco and groceries. Probably the most important trading post at this time was the Robinson store at Lake Court House (modern Crown Point). From the trading transactions carried on here we learn that—

> Indians were the most profitable customers prior to 1840, for many of the white settlers ran accounts which some of them were slow to pay or sought to default. The Indians, on the other hand, most of whom were Potawatomi, periodically brought in large quantities of cranberries and bundles of furs which they traded for articles of food, clothing, or ornaments. The cranberries were probably shipped by wagon to Peoria, Chicago or Detroit.[71]

Without recourse to any published natural vegetation map of the period, one may wonder where the cranberries came from. Field notes on the original land survey, expressed here in cartographic form for the first time, are revealing and illustrate well the useful purposes served by mapping and correlating original land-surface and vegetation data. A cranberry marsh appears just west of Crown Point. Though others are recorded elsewhere on the map at more distant points (for example, along the Lake Michigan shore in Porter County), it was no doubt this

[70] J. Wm. Lester, "Pioneer Stories of the Calumet," *Indiana Magazine of History*, Vol. XVIII, No. 4 (December 3, 1922), pp. 347–358.

[71] Robinson, *op. cit.*, p. 20.

marsh and the one immediately to the north from which the cranberries were obtained.

Store Commodities of the Pioneer Period

A community store of the general merchandise type, as we think of it today, did not make its appearance from township to township until well in the late thirties or rather in the early or middle forties. For example, in the western part of the Calumet the first mercantile effort in Frankfort township began in 1836. The first store in Liberty township was established in 1845 on Salt Creek. The "stock was small, not much larger than is usually carried by a stout peddler, and consisted principally of those articles included in the comprehensive term 'Yankee notions.' "[72] It is generally held that the Calumet pioneer, isolated as he was from the settlements in the East and South, had only the most meager home furnishings and supplies. That this was generally true is not questioned, but this was not due so much to lack of a variety of general merchandise in the near neighborhood as to the impassable roads and marshes which made travel and transportation even to a market only a few miles away a most trying experience.[73]

Interregional Trade—Calumet Trade Centers

Chicago—West Calumet Trade Center

Although the limited area first occupied by Chicago is not an integral part of the Calumet, Chicago's proximate geographic position and its prominence in pioneer days as a commercial rival of Michigan City and of other would-be famous

[72] Goodspeed, *op. cit.*, p. 211.

[73] During the transition from Indian to white man's occupance, the leading store in Chicago, at the corner of West Lake and West Water, according to Shapiro, stocked the following goods:

Arm bands, blankets, broad cord, blue cloth, Brown Russia sheeting, blue bernagore, handkerchiefs, black silk handkerchiefs, black ribbons, boxwood combs, barrel biscuit, black bottles, boys' roram hats, brass jewsharps, beads, blue cloth trousers, blue cloth capotes, beaver shot, balls, black wampum, barrel salt, colored ribbon, crimson bed lace, colored gartering, carouche knives, colored cork feathers, cod lines, colored worsted thread, cotton wick balls, cow bells, covered copper kettles, common needles, cotton bandanna handkerchiefs, duck shot, darning needles, embossed serbe, English playing cards, ear wheels, brooches, furniture, cotton, fox tails, feathers, flour, fine steels, gun flints, girls' worsted hose, gorgets, gun-powder, gurralis, highland striped gartering, hawks' bills, hari trunks, half axes, high wines, hose, hand sleds, Irish linen, Indian calico handkerchiefs, ingrain ribbon, ivory combs, ingrain worsted thread, ink powder, japaned quart jacks, kettle chains, knee straps, London scots gartering, large round ear bobs, looking glasses, mock garnets, maitre de retz, men's shirts, men's imitation beaver hats, moon paper, narrow cord, nuns' thread, nails, northwest guns, painted cotton shawls, plain bath rings, pen knives, pierced brooches, portage collars, pepper, pins, pipes, pork, scarlet cloth, shoes, spotted swan skin, silk ferrets, scarlet milled caps, scalping knives, St. Lawrence shells, stone rings, turgeon twine, snuff, snuff boxes, snaffle bridles, stirrup irons, two sheeting, therick, tomahawks, tobacco, vermillion, white crash brushes, white molton, waist straps, white wampum, whisky. *Source:* Dena Evelyn Shapiro, "Indian Tribes and Trails of the Chicago Region," an M.A. dissertation submitted to the graduate faculty, Department of Sociology and Anthropology, University of Chicago, March, 1929.

ports along the Michigan Lake front tie it interregionally with the affairs of the Calumet. Chicago became the market for west Calumet, just as Michigan City served the pioneer in the east section. In the previous Pottawatomie period a government fort—Fort Dearborn—had been established there; also an Indian trading post.[74] On it converged the arterial Indian trails on the west end of the Calumet, crossing the Calumet from the east, south, and west, just as the major trails on the east end of the Calumet converged on Michigan City. These set the pattern of roads, traffic and trade for the pioneer period. The first stage coach through the Calumet came from Detroit in 1833 and had its terminus at Chicago (Fig. 10c). The attraction which this place had for tourists already in this period had much to do with bringing streams of immigrants into the Calumet, many of whom then decided to settle here.

The immigrants at first were merely consumers, and such trade as there was with outside regions was almost altogether of the import type. In 1836 Chicago's imports amounted to $325,203; exports only $1,000. But during the following years this relationship changed.

> Imports in 1842 were estimated at $664,347, while the exports were valued at $659,305. But by 1847 imports and exports were worth respectively $2,641,852 and $2,296,299. The commerce of Chicago's port, both imports and exports, grew steadily during this period from 1830 to 1850. Previous to 1839 the increase in exports was slow because many of the newcomers, instead of applying their energies to the labors of production, were devoting themselves to speculating. The result was that although the surrounding territory had changed remarkably in the course of five or six years, nevertheless it was not developed sufficiently to supply the home market. . . . Grain, the direct product of the soil, was the chief article of export. Wheat, the most important cereal, was first shipped from Chicago in 1839 [Fig. 10a]. The initial consignment was small, but it is significant that there was any surplus, since 1837 flour readily brought $13 per barrel in Chicago a fact which would indicate a scarcity of wheat at that time. But in these two years conditions had changed; flour and wheat were both in surplus, and exportation had begun. . . . The raising of wool, too, was found to be exceedingly profitable, the first being marketed in 1842. Beef and pork were also brought in large quantities to this central market and forwarded for eastern comsumption. . . . The commercial growth of Chicago made necessary an increase in the number and size of business houses at that place. In 1831 Chicago had only one store, but in 1832 there were three, and by 1835 the number of dry goods, grocery, hardware and drug stores, was more than fifty. More-

[74] Built in 1804 at the mouth of the Chicago River, it was fired by the Indians in 1812 and rebuilt in 1816. It was finally dismantled in 1835. Though Fort Dearborn does not appear today as a relict landscape fixture reminiscent of the Pottawatomie-French Fur Trading Period, it serves as a good example to illustrate the principle that geographers cannot be content in a sequence study like this to consider only those antecedent occupance forms whose vestiges appear morphologically in the modern landscape. Period-to-period heritages may be quite as significant in interpreting modern landscapes as observable vestigial landmarks. For such significance, see Meyer, *op. cit.*, p. 251.

Darby has designated this historicogeographic concept as a fourth dimensional ingredient necessary in geographical study: "Whatever the limits be, the fact remains that the landscape we see today is a collection of legacies from the past, some from geological, some from historical, times." H. C. Darby, "On the Relations of Geography and History," Reprinted from *Transactions and Papers,* Institute of British Geographers, No. 19 (1953), p. 11.

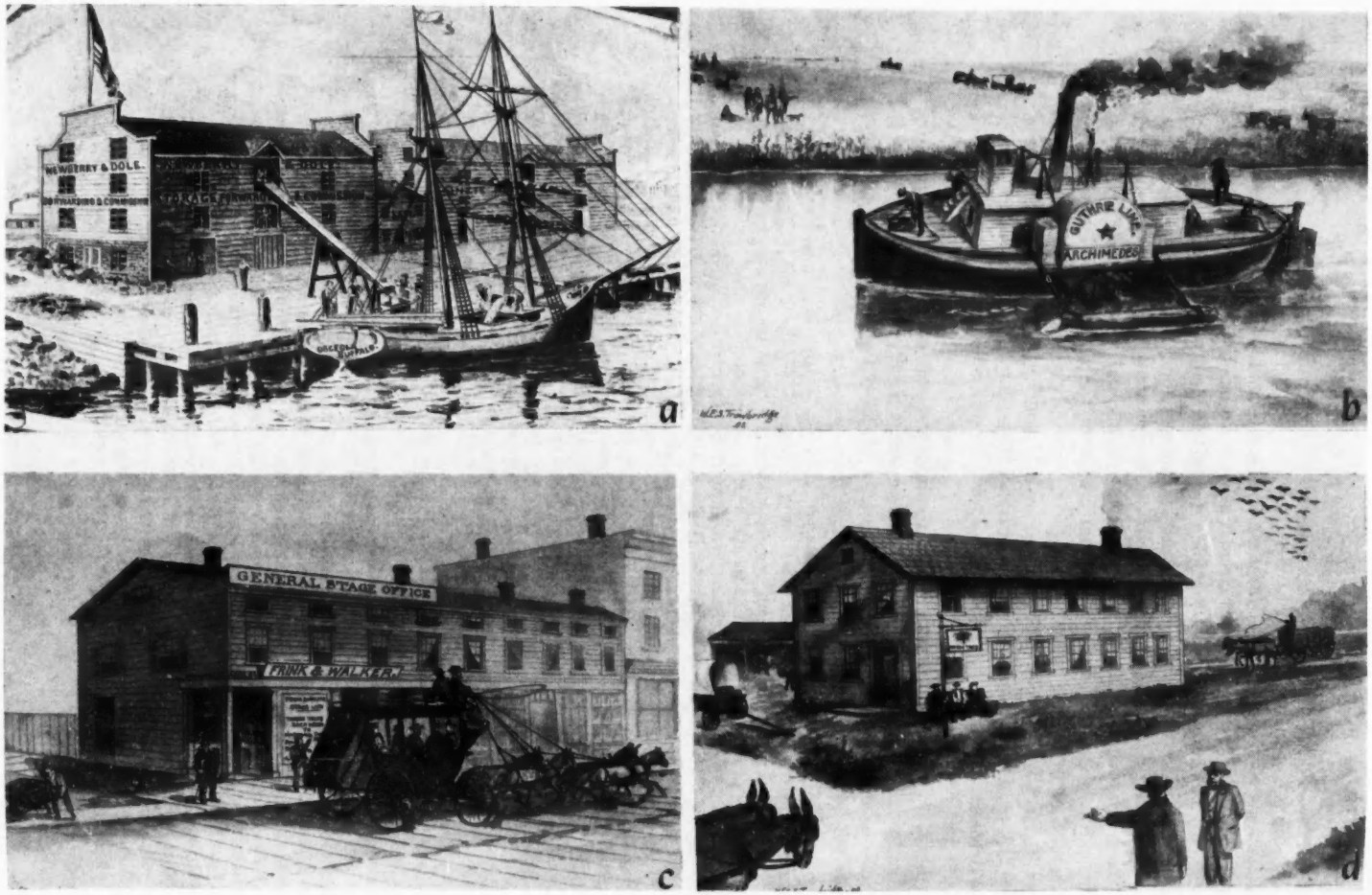


FIG. 10. Views of the city—Chicago—that won the race against Michigan City and the "phantom" towns as the industrial center and commercial "entrepot" of the Midwest. (a) First shipment of grain from Chicago, 2900 bushels of wheat via Brig Osceola, Sept. 1839, to Black Rock, New York; (b) Steam tug "Archimedes" built about 1835 and used in building the Illinois and Michigan Canal; (c) Frink and Walker's Stage Office, southwest corner Dearborn and Lake streets in 1844; (d) Green Tree Tavern, Northeast corner Lake and Canal streets, built in 1833 by James Kinzie. *(Courtesy, Chicago Historical Society.)*

over, the spacious streets were crowded with carts and wagons; there was a bustling trade, where but a short time before was the unbroken prairie. . . . Because of these facts the interdependence of Chicago and her hinterland has been very marked. However, in spite of this interdependence and although the development of either Chicago or northern Illinois was impossible without the development of the other, yet the building up of neither could have taken place without a third factor—efficient transportation facilities connecting them with the eastern markets.[75]

Ball gives us further insight into the chief types of trading commodities.

Exports of produce commenced about 1840. Grain and pork (pork meaning hogs dressed ready for the meat market) were the first to be sent from the farms, and then cattle. There were, however, exports, and in immense quantities for the number of inhabitants, of quite a different kind. These exports were wild game, "prairie chickens" so called, in great numbers, wild ducks, wild geese, quails, rabbits, and also very much fur. This class of exports, costing nothing but the taking, helped many pioneer families in the way of better living. Soon, added to the grain and cattle and pork, there were sent from the farms, butter, eggs and poultry, hay, some wool, some honey, and some sheep. And at length many horses. Grass seed and fruit soon increased the list of exports.[76]

Michigan City—East Calumet Trade Center

How the Michigan City port site first of all received its name is of historic-geographic interest. The master map shows a so-called Old State Boundary—Southern Boundary of Ten-Mile Purchase, ten miles south of the present Indiana-Michigan state boundary. The territory between these boundaries originally belonged to Michigan, and so it was presumed by some people that Michigan City was so called because of its identification with the state of Michigan. Others have ascribed the name to the so-called Michigan Road projected from central Indiana to this lake port. The fact is that both the road and the city directly derive their names from Lake Michigan itself, whose port site and road terminal qualities were fully appreciated by the Indiana state authorities, as is illustrated in the Ten-Mile Purchase and the state appropriation for the Michigan Road.

It is significant to note some of the salient facts which give us insight into the early settlement and economic development of the one community which won the race against all its Calumet port competitors of the pioneer period. The following account by Chapman has been selected from among many others for its excellent physiographic and demographic details. It shows just how a successful pioneer town evolved socially, politically, and economically in the wilderness of the Calumet frontier.

Isaac Elston, of Crawfordsville, Ind., in 1831 purchased of the Government the land on which Michigan City is now located, and in October, 1832, he laid out the town. The town site was an uninviting one, a large portion of it being low and marshy, and was covered with a heavy growth of pine timber, among which were a few sugar maples. Trail creek made its way over the sands to the lake, winding round the foot of Hoosier Slide, a still sluggish stream which was almost cut off from the lake by a bar at its mouth, where so little passed over that a person could cross it without difficulty on foot. At this point it was believed a good harbor could be made. Hence the purchase made

[75] Lee, *op. cit.*, pp. 22–25.
[76] Ball, *op. cit.*, p. 402.

tug "Archimedes" built about 1835 and used in building the Illinois and Michigan Canal; (c) Frink and Walker's Stage Office, southwest corner Dearborn and Lake streets in 1844; (d) Green Tree Tavern, Northeast corner Lake and Canal streets, built in 1833 by James Kinzie. (*Courtesy, Chicago Historical Society.*)

> by Major Elston, and all the subsequent operations toward building up a flourishing city, and a harbor on the Great Lakes, for the state of Indiana. Formerly the line between Indiana and the Territory of Michigan was south of where it is now located, shutting Indiana off entirely from all harbor facilities and lake commerce, thus depriving her of all the benefits to be derived from the immense commerce of the Great Lakes. . . .
> In 1833 the first settlers arrived in Michigan City. The low, swampy lands covered with timber, and the high sand hills, presented but few attractions to welcome them. There were presented to their view only sand ridges and marshes. Hoosier Slide loomed up many feet, while below and all around it there was only the white, glistening sand, and further back, across the creek that passes through the woods, that were at that time the abode of wild beasts, only a low, wet tract of country. It was indeed a discouraging outlook for a city. But the hope that one day a city would arise there despite the many adverse circumstances, and that a harbor would be made which should be to Indiana what Chicago is now to Illinois, filled these first comers with the spirit of enterprise, and the work of improvement began. . . .
> Warehouses were all built down near the present harbor, the business part of the city being in the vicinity of where the Michigan Central depot now stands. This town was the great grain market for a large portion of Indiana, grain coming from as far south as Marion county. Steamers began to make regular trips, and the commission and forwarding business became active and heavy, assuming immense proportions. Besides the large number of warehouses and forwarding houses here in 1836, there were 12 large dry-goods stores. . . . During the years 1834-'36 the growth of the city was rapid far beyond the wildest expectations. It was estimated that in 1836 the city numbered over 3,000 inhabitants.[77]

Regionally, the commercial importance of Michigan City is reflected in the naming of one of the settled prairies—the "Twenty-Mile" Prairie—from the distance to the nearest port. But its trade was not as provincial as this might suggest. Michigan City competed with Chicago as a meat packing center, processing both beef and pork in the early forties. As the chief Indiana-Illinois distributing center of Michigan salt, it attracted patronage from the "Wabash people" and others at distances requiring weeks of travel. It is interesting to note also that settlers came all the way from Chicago, Rockford, Joliet, and Galena, Illinois, to purchase flour from Michigan City mills.

But the leading industry of Michigan City in the forties, after the opening of the harbor, is said to have been lumbering, and lumber became a leading export item. This is readily understandable. Probably few sites in the Calumet region were as well situated geographically as Michigan City for the exploitation and exportation of this product. As indicated by the negative vegetation on the master map, no other Calumet community fared better in the mixed softwood and hardwood timber stocking. As a lake port Michigan City could readily ship to other lake ports, especially to its neighbor Chicago, whose phenomenal demand for construction of frame buildings and plank roads was a steady market for Michigan City lumber.

TRAVEL AND TRANSPORTATION PROBLEMS

As indicated above, the lack of commodities needed to make for comfortable living in the Calumet pioneer home was not due to their unavailability but rather to the difficulty of travel and transportation. A glance at the fundament map and

[77] Chapman, *op. cit.*, pp. 746–748.

profile sketches in Figure 2 reveals at once the chief handicaps to communications and circulation. A remarkably large percentage of the Calumet consisted of marsh, swamp, and wet prairie. A correlation of these wet forms of the landscape with the land surface, best shown on a relief map, indicates the reason for the poor drainage conditions.[78] The wet areas coincide largely with the Lake Chicago Plain. It will be noted that extensive areas on this plain are represented without a single contour. Only sand dune-beach ridges and island formations interrupt the complete flatness of the landscape.

Except for local swales, the terrain of the moraine sections was high enough to be well drained. However, the forest cover, the heavy clay soils, and the occasional steep slopes constituted other handicaps to road construction and circulation which had to be reckoned with. Under these circumstances, the settler in the Calumet faced the problem of weighing terrain travel conditions against the difference in mileage to the two chief markets—Chicago and Michigan City.

> The early settlers usually disposed of their farm products at Michigan City or Chicago. A trip to market, which was considered an event, was as a rule unprofitable. In 1839, George Parkinson drove to Michigan City, a distance of forty miles, to sell pork, for which he received $4.50 a hundred pounds. On another occasion he hired a man to haul a load of grain there, and after paying for the hauling had but fifty cents left from the sale.[79]

The marketing of meat and hides involved similar problems, as is illustrated by the experiences of a Hanover resident who had as many as thirty-six carcasses hanging in the woods to be transported to Chicago as soon as roads became passable.

How the Calumet River and marshes necessitated a detour is indicated as follows:

> At the time of the first settlement in 1833, and for some time thereafter, if you wished to mail a letter, buy a pound of coffee or any other small article for the house, you had to drive to Michigan City, twenty-five miles away or to Chicago forty-five miles away. In going to Chicago you had to go around by Blue Island to avoid the Calumet River and the Calumet Marshes.[80]

Thus what is today a part of a leading transportation center in the world was an area of most difficult internal circulation. As with so many regions of that day, emphasis was on water transportation, both locally and nationally.

Already in the early thirties there was agitation for building the Illinois and Michigan Canal to connect Lake Michigan with the Illinois River. In fact, a strip of land twenty miles wide, bounded on the southeast by the Indian Boundary Line shown on the map diagonally crossing Cook and Will counties, had already been ceded by the Pottawatomie to the government in 1816 for this purpose. In 1821 Congress appropriated $10,000 for a preliminary survey of the canal.[81]

[78] Meyer, *op. cit.* Fig. 4, p. 253.

[79] "Historical Records of the Lake County Old Settlers and Historical Association of Lake County, Indiana, 1924," p. 23.

[80] Bowers *et al., op. cit.*, p. 82.

[81] "The project of a ship-canal, to connect the waters of Lake Michigan with the navigable

Railroads had not in this period reached the Calumet and long distance travel was by stage coach. Accordingly, the Calumet settler on the Illinois side shared the enthusiasm of others near the proposed route of the canal for a water route which would efficiently and economically transport the farmers' grain and other produce. What the frontiersman in 1834 thought the canal would do for the Chicago and the Mississippi valley region is well expressed by a noted contemporary writer:

> As a place of business, its situation at the central head of the Mississippi Valley will make it the New Orleans of the North; and its easy and close intercourse with the most flourishing Eastern cities will give it the advantage, as its capital increases, of all their improvements in the mode of living.
>
> There is one improvement to be made, however, in this section of the country, which will greatly influence the permanent value of property in Chicago. I allude to a canal from the head of Lake Michigan to the head of the steam navigation on the Illinois, the route of which has been long since surveyed. The distance to be overcome is something like ninety miles; and when you remember that the head-waters of the Illinois rise within eleven miles of Chicago River, and that a level plain of not more than eight feet elevation above the latter is the only intervening obstacle, you can conceive how easy it would be to drain Lake Michigan into the Mississippi by this route; boats of eighteen tons have actually passed over the intervening prairie at high water. Lake Michigan, which is several feet above Lake Erie, would afford such a neverfailing body of water, that it would keep steam-boats afloat on the route in the dryest season. St. Louis would then be brought comparatively near to New York; while two-thirds of the Mississippi Valley would be supplied by this route immediately from the markets of the latter. This canal is the only remaining link wanting to complete the most stupendous chain of inland communication in the world.[82]

Construction of the canal was finally undertaken and it was completed in 1848 (Fig. 10b). This was a most decisive factor in giving Chicago an initial commercial pre-eminence over its closest rival—Michigan City. The other chief technological innovation responsible for immediate and revolutionary transformation of the Calumet scene was the railroad. The first railroad to enter Chicago came from the west in 1848. And in 1851, the Lake Shore was the first to cross the Calumet from the East. The sectional road grid in embryonic form now supplemented the relict Pottawatomie trail pattern. Modern fenced-in farmsteads with frame buildings took their place alongside the pioneer log and block houses. Reclamation-minded farmers started to dig ditches to drain the marshes and wet prairies. The McCormick reaper, together with other mechanized agricultural implements, transformed the rural scene from one of mere subsistence economy to that of commercial agriculture. On the urban side of developments, the "phantom" port speculative real estate ventures now gave way to "boom" railroad depot community promotion. Already by 1856 eleven trunk lines converged onto Chicago, and new "station towns," developing along all the right of ways, signalized a new pattern of occupance—the third, from 1850 to 1900, to be treated in a subsequent paper.

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waters of the Illinois river, was first suggested during the war of 1812, by some writer in the *Niles' Register*." Woodruff, *op. cit.*, p. 298.

[82] Charles Fenno Hoffmann, "A Winter in the West," *Fergus Historical Series, No. 20* (1882), pp. 21–24.

LAWRENCE MARTIN, 1880–1955

FRANK E. WILLIAMS

LAWRENCE Martin's contributions to physiography and geography cover a wide range of subject matter and a great number of publications. In his earlier work he was primarily interested in geology and physiography. His work in World War I and in his later positions led him more and more into various phases of historical and political geography. In his work in this diversified field he made and retained many important contacts with notable personalities. That he was able to do this was due to his sense of humor, his calmness and his tact in diplomacy.

He was an indefatigable worker in research and in writing and spent very little time in relaxation. For physical exercise he depended for the most part on his daily brisk walks in the field or near his home. At his summer home in Maine he sought respite in cutting down trees and in collecting, from his row boat, peculiar forms of driftwood which he placed around the veranda of the summer cottage.

Colonel Martin was born in Stockbridge, Mass., on February 14, 1880, the son of William Proctor and Fannie Hare Martin. He was graduated from Cornell University in 1904. While an undergraduate he supported himself mainly by typing Professor Ralph S. Tarr's manuscripts. This gave him his first serious interest in physiography which was to become an important phase of his future work.

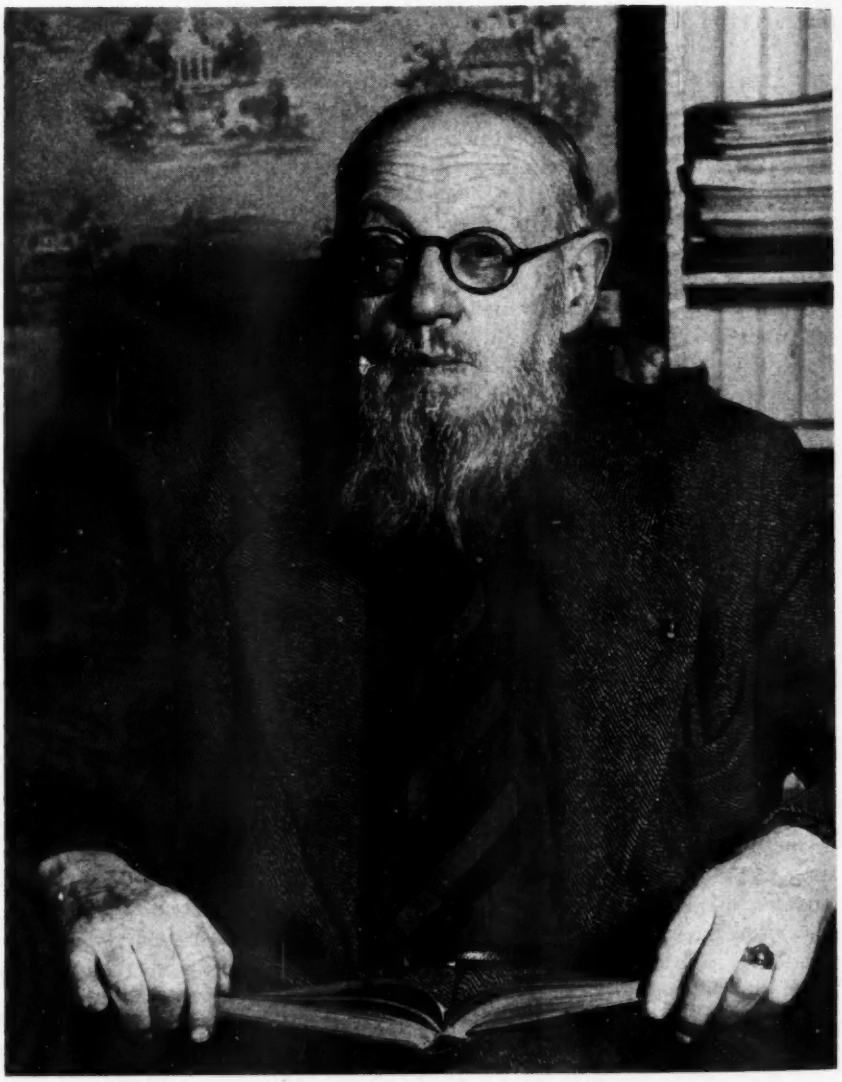
When he went to Harvard University for graduate work he found that he was, at that time, the only student of William Morris Davis. He thus received the full impact of Davis's remarkable intellect and his great power of analysis. He received his Master's degree at Harvard in 1906. He later carried on further study at Cornell and was granted a Ph.D. from the latter institution in 1913.

In 1906 he was appointed instructor in physiography at the University of Wisconsin to take the place vacated by N. M. Fenneman. This was a period of pioneering in geography at Wisconsin, and Martin and R. H. Whitbeck shared in developing human and other phases of geography. In 1917, then an Assistant Professor, he volunteered his services in World War I and was sent to Fort Sheridan where he taught fundamentals of map making and map interpretation to prospective officers.

AS A PHYSIOGRAPHER

While Martin maintained an interest in almost all phases of geography throughout his adult life, the major part of his work was achieved along two main fields: physiography until World War I; historical and political geography thereafter.

From the time he began work with the U. S. Geological Survey in 1903 until 1917 he was primarily interested in geomorphology. Early in his career he be-



LAWRENCE MARTIN, 1880–1955

came interested in glacial studies—a field in which he became notably proficient. To many, he is best known for his work on Alaskan glaciers. His first contribution to glaciology came as a result of his work as a member of a U. S. Geological Survey party in 1904. Through grants from the American Geographical Society he, in association with Ralph S. Tarr, conducted several later expeditions to Alaska to study the advances and recessions of glaciers in the southern part of that territory. A large part of the research of these expeditions bore upon the relation between the advance of Alaskan glaciers and the Alaskan earthquake of 1899. The expedition of 1910 was conducted by Martin alone as Tarr was engaged elsewhere. Many papers were written as a result of their field work, in addition to the classical volume *Alaskan Glacier Studies* published by the National Geographic Society in 1914. For the International Geological Congress of 1913 he acted as guide to the excursions to Southeastern Alaska.

In the meantime Martin was concerned with research in the physiography of Wisconsin. In addition to many papers relating to this area he wrote *The Physical Geography of Wisconsin* (1916) and edited Tarr and Martin's textbook on *College Physiography* (1914).

AS A POLITICAL AND HISTORICAL GEOGRAPHER

While Martin retained his interest in glaciology and other phases of physiography, during and after World War I he became more and more concerned with national and international relationships. His work in the Military Intelligence Division in World War I gave him access to valuable sources of information and interesting and important contacts. Military and government leaders recognized his ability and he was selected as a member of a group who worked on peace negotiations in Paris at the close of the war. He was chosen for the military mission to Italy and was awarded the Order of the Crown of Italy in 1922. The studies he made at the end of World War I on the location of the border between Austria and Hungary are noteworthy, and his contributions, with others, had much to do with the geographical principles which formed the basis of the new international boundaries as described in *The Treaties of Peace, 1919–1923.* He accompanied General Harbord on his mission to the Near East, where he met many notables including Queen Marie of Rumania.

As a result of his interest in and knowledge of boundary principles he was often called in as a consultant on boundary disputes, some of which follow:

The Minnesota-Wisconsin case, 1917

The Michigan-Wisconsin Boundary case, 1923–26 (material was used as his presidential address before the Association of American Geographers in 1929)

The Palmas Island Arbitration, 1925–27

The Guatemala-Honduras Arbitration, 1932

The Virginia-District of Columbia Boundary case, 1935

In his long career Colonel Martin held a large number of varied and responsi-

ble positions. From 1924 to 1946 he was chief of the Map Division of the Library of Congress and was made the first incumbent of the chair of Geography in the Library. While there he almost doubled the number of maps and atlases of that branch of the Library. After his retirement in 1946 he served as Honorary Consultant in Geography for the Map Division.

He was Geographer of the Institute of Politics at Williamstown, Mass., 1921–27. While there he convinced the lecturers and diplomats that geography was important in their discussions—a concept that many of them had not previously appreciated. His belief in the educational value of the map was shown when he set up the maps in World War I and II in buildings where Congressmen could not help but see and learn some world geography. In his post-war activities he did not entirely disasssociate himself from academic work. He was Gilman Memorial lecturer at Johns Hopkins University, 1920–21; lecturer at Georgetown University, 1921–23; lecturer at Clark University, 1922–23; and taught at the University of Southern California in the summer of 1928.

In the famous coast to coast excursion of 1912 he edited a daily newspaper which added interest and spice to the morale of the trip.

He was a member of several professional organizations, such as the Association of American Geographers, the Geological Society of America, the Explorers Club, the U. S. Geographic Board, the U. S. Board of Surveys and Maps, the U. S. Board of Geographic Names, and the National Research Council.

In his later years he spent much of his time in research and in collecting material concerning the John Mitchell Map and the discovery of Antarctica by Captain Nathanial Brown Palmer. He left behind two unpublished manuscripts as a result of this research.

Colonel Martin was not only a man of many ideas but he had the will and energy to dig for facts—be they favorable or unfavorable to his original concept. The writings from his prolific pen are concise and clear.

Colonel Martin died on February 12, 1955, after a long illness. To those of us fortunate enough to have been closely associated with him and to have felt the impact of his personality, he will be long remembered as a man of energy, versatility, integrity, and a delightful companion.

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Stephen Sargent Visher. *Climatic Atlas of the United States.* Cambridge: Harvard University Press, 1954, xii and 403 pp., 1031 maps and diagrams.

In the Introduction to his *Climatic Atlas of the United States* the compiler quotes approvingly from Isaiah Bowman to the effect that "Facts more valuable than all the gold of the Klondike lie buried in the Weather Bureau's climatological records." Like the Klondike gold, however, these facts are of little use to anyone until they have been dredged up, refined, and put into some useful form.

Throughout his professional life Dr. Visher himself has been industriously and assiduously digging out and refining climatological facts about the United States. At the same time he has kept a sharp eye on the lookout for significant and useful climatological facts compiled by other individuals and organizations. The kinds of data in which he has interested himself are matters of classical climatology, and so energetically and intelligently has Dr. Visher applied himself that he has long since become the United States' foremost classical climatologist. Many of the more useful and significant results of this long career now have been assembled in his *Climatic Atlas of the United States.*

Although the volume is not large for an atlas, one is inclined to describe it as monumental. Scores of maps in the volume are highly deceptive. Simple, small, black-and-white maps, containing perhaps just a few lines wandering across the United States, nevertheless, they represent a prodigious expenditure of effort—effort on the part of the thousands of patient observers who originally collected the data, and then on the part of the map maker. One thinks in this connection of such maps as Figure 324, "Freeze and Thaw Frequency," by R. J. Russell; Figure 962, "Temperature Regions Based on Seasons," by R. Hartshorne; and Figure 984, "Climatic Regions," by E. A. Ackerman.

The atlas contains a total of 1,031 maps arranged by topic. Most of the maps give data on the climatic elements—temperature, winds, sunshine, and hydrometeors. To list satisfactorily the contents of the atlas would require almost a listing of the table of contents. Temperature data might be used as a sample. The atlas contains maps of normal annual, seasonal, monthly, and weekly temperatures. There are maps of length of growing season, first and last frost dates, frost frequency, frost penetration, and cold waves. Data also are presented on extremes of heat, freezing and thawing alterations, heat waves, and chinooks. Also, as Charles F. Brooks notes in his brief foreword to the atlas, "The coverage of precipitation is very impressive."

The volume contains a chapter entitled "Some Consequences of Climate and Weather." Many of the maps in this section present selected aspects of agricultural climatology; others contain data on soil erosion, stream spacing, and soil moisture. The atlas ends with a series of maps showing various climatic regionalizations of the United States, and a few maps and diagrams pertaining to possible climatic changes and long-term variations and periodicities.

The atlas opens with a 22-page "Introduction—Summary" by Professor Visher in which he tries to make the very broadest kinds of generalizations about the distribution of climatic elements over the United States and to render intelligible to the uninitiated some of the major controls of climatic distribution.

Not the least valuable part of the volume is the section on References. This section constitutes a selected bibliography and guide to almost all of the major sources of data on the climates of the United States and to many of the more valuable specialized sources. It is invaluable as a guide for students.

At various places in the volume the captions of maps have been interchanged. Inasmuch as these caption switches are easily recognized, they are of no importance except, perhaps, to irritate the compiler.

No serious student of either climatology or North America can afford not to familiarize himself with the contents of this atlas or not to have the volume immediately available for consultation.

WESLEY CALEF
University of Chicago

W. S. Woytinsky and E. S. Woytinsky. *World Population and Production: Trends and Outlook.* New York: The Twentieth Century Fund, 1953. lxxii and 1,268 pp. Maps, graphs, diagrams, bibliography, index. $12.00.

———. *World Commerce and Governments: Trends and Outlook.* New York: The Twentieth Century Fund, 1955. lii and 907 pp. Maps, diagrams, graphs, bibliography, index. $10.00.

The purpose of this imposing pair of volumes is to "put between the covers of two manageable volumes . . . a statistical picture of the collective resources, as well as the economic performance and promise of the full array of the nations of the world" (I, v). This compendium, which covers so vast a range of topics that the two Tables of Contents contain no less than 35 pages, can be summarized here only in the sketchiest fashion. In the first volume, after a brief, rather perfunctory outline of the elements of Man's physical environment, there follows a survey in some detail of the demographic characteristics of the world's population and of human needs, resources, and consumption patterns. Next we have a lengthy treatment of agricultural, forest, and marine production, mineral resources and industries, and, lastly manufacturing industries. The second volume takes up three large blocks of subject matter in formidable detail: trade, transportation, and various aspects of national and international government.

In general, the handling of the several scores of topics tends to adhere to the same outline: a brief historical sketch leads into a discussion of such technical aspects of the subject as are needed for an understanding of its spatial distribution and statistical trends; then follows a presentation by means of text, table, graph and map of the important statistical attributes of the item, with special emphasis on extent of resources and production in the case of economic topics. This statistical exposition characteristically begins by scanning the world picture or major world regions, but dwells next at greater length on important individual nations. Except in the case of the United States, which is necessarily accorded preferential treatment throughout a work of this sort and occasionally is handled on the state level, sub-national political units are almost never recognized, and there is scarcely any notice of regions that transcend political boundaries. This approach leads to particularly deplorable results in the flimsy treatment of internal trade and transport or in the discussion or mapping of nations of quasi-continental size, such as the U.S.S.R., India, China, Canada, and, sometimes, the United States. Special attention is devoted to a comparison between pre-World War II and post-war conditions (up to about 1948 or 1949 in Volume 1 and 1952 in Volume 2); and, in a few cases where the data warrant the effort, some forecasts of future trends are offered.

The major contribution of this work lies in its 788 numbered tables and its numerous shorter tables, most of which are original compilations from a wide variety of official and quasi-official sources. That this accomplishment called for a herculean expenditure of labor and considerable technical ingenuity is a fact that will be appreciated by anyone who has ever tried to assemble even one such world-wide, composite table. The tabular material furnishes an exceedingly valuable supplement to the excellent demographic and economic publications of the United Nations and the more advanced countries of the world. The generosity of the sponsors of this project is reflected in the prodigal use of graphs and maps, some 504 of which—all of ample scale, many probably too ample—are scattered throughout the two volumes. This is, indeed, the unique example in this reviewer's experience of a work which may have been too fully illustrated. The quality of the statistical maps edited by the Woytinskys is well above par for non-geographic (and many geographic) publications. The authors deserve a round of applause for their imaginative use of Raisz's "Armadillo" projection for their world base map where more timorous souls would have settled for better known projections, although other projections should have been considered for certain topics. Furthermore, many of these drawings represent valuable first attempts at charting the concepts in questions. It is apparent that this survey fills an important gap in the reference equipment of economic and population geographers. It is to be hoped that sequels may appear at reasonably short intervals in the future.

Since we are so deeply indebted to the indefatigable Woytinskys, it is disturbing that a reviewer is obliged to note the several serious shortcomings in their work. First, and probably foremost, is the fact that it is humanly impossible for two authors—even such seasoned economic encyclopedists as the Woytinskys—to encompass and digest thoroughly such a stupendous mass of subject material in even five years of the most concentrated labor. The result is that, in spite of the merits of the tables and maps, the text is relatively trivial both qualitatively and quantitatively. Less than half of this ponderous work consists of text; and most of this is, in turn, a tedious paraphrase of the tables and illustrations. In addition, there are altogether too many examples of redundancy within the text. Such technical matters as

the breeding habits of salmon, the economic geology of petroleum, or the various methods for producing steel are best consulted in readily accessible standard tomes; and most of the remainder of the non-statistically oriented text is devoted to the recapitulation of theories contained in many popular texts on demography, economics, political science, and geography. The historical passages are so brief and disjointed that the effect is more a parody of scholarship than anything else. Finally, the prose style is pedestrian at best and deadening at worst, so that it has a peculiarly soporific effect after a few pages. The authors should have acquainted themselves with their limitations and decided either to restrict the scope of their investigation so as to turn out a product with less surface and greater depth or to reduce the present opus to a statistical handbook with a bare minimum of explanatory text.

By spreading themselves so thinly over so cosmic an expanse of facts, the authors incur the risk of factual inaccuracy and faulty interpretation. They are least vulnerable in the purely economic sections where they are treading familiar ground; but their relatively amateurish approach to matters geographic, demographic, and anthropological leaves much to be desired. In the case of history, the reader should maintain a healthy skepticism toward any statement dealing with the preindustrial era. This reviewer encountered a number of factual blunders and an abundance of obsolete ideas in the demographic chapters, and has little doubt that a methodical checking of the text would unearth a great many more. It is particularly regrettable that recent population data and studies that were available when the text was being written were not consulted, for they might have substantially altered the statements on present and future trends in world population numbers and characteristics. Only a single topic, namely water resources, appears to have suffered serious neglect among all those touched upon, and this may well result from the paucity of international statistics on the subject.

Although this work does not profess to be much more than a compendium and a commentary only a single degree removed from raw fact, it is still extraordinary how barren it is of any ideas except of a second-hand variety. It is dismaying to plod through these 1,860 pages in the fond hope that the juxtaposition of so many thousands of newly gleaned facts might suggest to the authors some original insight into the economic workings of the world and the demographic behavior of its inhabitants, and then come to the end empty-handed. What is equally striking is the complete lack of any cumulative effect, i.e., the weight of the whole is no greater here than that of the sum of its individual parts. Closely akin to this defect is the absence of any interrelations among the various chapters or of any meaningful sequential development of subjects. Structurally, these volumes have approximately as much strength as an encyclopedia or a telephone directory. It is only when the authors venture to engage in prediction, notably of the world's future population and energy resources, that anything resembling originality emerges, and even here caution is the password.

In drawing a balance, it must be said that these volumes form a monument to the industry and resourcefulness of the authors, that as a storehouse of recent economic and demographic facts they will claim a prominent station in the reference collection of every library and scholar in the social sciences for some years, but that their factual opulence is sadly out of proportion with the intellectual aridity of the text.

WILBUR ZELINSKY

Paul F. Lazarsfeld and Morris Rosenberg, editors. *The Language of Social Research: A Reader in the Methodology of Social Research.* Glencoe: The Free Press, 1955, 590 pp. $6.75.

Many geographers will be concerned with this book; it is part of the methodological literature of social science. For some, the book might be the textbook in an introductory seminar, but since none of the readings is from the geographic literature, the book might seem quite foreign to the beginning student who has little grasp of the essential sameness of methods. On the other hand, there is no book in the specifically geographic literature directly concerned with the formal development of theory and the interplay of theory with efficient and theoretically oriented empirical studies. This book may help meet our needs.

This book does not treat all the methods used by social scientists; the particular methods discussed are intermediate between those that are well codified and those that are largely implicit. On the one hand, discussions of methods which enjoy a standardized literature are eliminated, e.g., experimental techniques

and methods which require a high level of mathematical sophistication. On the other hand, no attempt has been made to discuss methods in fields where methodological facets of research have not been codified, e.g., the tradition of literary exposition of mass observations. The reviewer is tempted to classify the book somewhere on a scale of methodology, a continuous scale with the methods of art and literature near one end and the methods of articulate theory and rigorous experimentation at the other. This seems appropriate but it should be noted that ". . . *the Reader emphasizes the analysis of materials which have been properly collected*" (p. 5), and to the reviewer this places the book much closer to the methods of experimental science than the tradition of mass observation.

The book is a reader, and the editors have incorporated some 64 statements which exemplify the methodology with which they are concerned. For the most part these statements are from published sociological literature, but other fields are represented, and there are a few inclusions of previously unpublished works. Thus, what we actually have is a reader of *some* of the methodology from *some* of the writing in social science.

The sample studies are grouped into six sections, and the editors introduce each section with an essay summarizing the particular section and relating the content of the section to the context of the book as a whole. These essays, together with the general introduction to the book, are an excellent statement of the "why and how" of modern social science and, viewed as a whole, are a "book within a book" worthy of perusal by any social scientist.

Concepts and indices are the subject of the first section. This section is divided further into five divisions incorporating topics such as "The Concept of Property Space" and "The Comparison and Evaluation of Indices." It also contains an introduction by the editors, and each division of the section contains two or more studies.

The remaining five principal sections of the book are treated in a similar manner. These five sections are: "Multivariate Analysis," "The Analysis of Change through Time," "Formal Aspects of Research on Human Groups," "The Empirical Analysis of Action," and "Toward a Philosophy of the Social Sciences." Each of these contains an annotated list of auxiliary readings. There is no index to the book as a whole.

A number of purposes underlie a book of this sort. The editors' intent is best revealed by their view of the place of methodology in social science: methodology (1) provides the student with the "discipline of thinking," (2) enables the student to cope with new and unfamiliar developments in his field, (3) contributes to interdisciplinary work, and (4) provides organizing principles by which knowledge can be integrated and codified. The editors, then, view the book as extending the student's knowledge of methodology and his abilities as a social scientist. How well the book serves this purpose gives one judgment of its value.

Almost any one of the major sections of the book could serve as a case in point. Take, for example, the second section, "Multivariate Analysis." This is a subject about which a great deal is known, from the standpoint both of philosophy and of technique. No amount of perusal of the section reveals the conceptual bases of multivariate analysis or our current knowledge of problems of multivariate analysis, and the section does not provide a good example of the great strength of multivariate analysis. To put the case in the editors' words, there is no development here of the rigor ("discipline of thinking") of multivariate analysis and no content that will enable the student "to cope with new and unfamiliar developments". "Contributions to interdisciplinary work" and "organizing principles" are not treated explicitly.

Perhaps this evaluation is too exacting. The section on multivariate analysis certainly would serve as an introduction to the subject, and it provides illustrations of studies using multivariate methods. However, readers concerned with multivariate problems should look elsewhere (e.g., Lawrence R. Klein's *A Textbook of Econometrics*) for more penetrating treatments of the subject. The point is that this section, and for that matter the book as a whole, is no more than an introduction to methodology.

Some parts of the book are, of course, more interesting than others. Allen H. Barton's "The Concept of Property-Space in Social Research" and Kingsley Davis' "Malthus and the Theory of Population" are especially good. Davis' treatment of Malthus is an example of modern axiomatic treatment of general social theories, an example from which geographers might well profit.

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